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SIXTY-FIRST

ANNUAL REPORT OF THE SECRETARY

OF THE

MASSACHUSETTS

STATE BOARD OF AGRICULTURE.

1913.

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STATE BOARD OF AGRICULTURE, 1914.

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Worcester County West,	JAMES A. RICE of Barre,	1917

The Commonwealth of Massachusetts.

THE SIXTY-FIRST ANNUAL REPORT
OF THE
SECRETARY
OF THE
STATE BOARD OF AGRICULTURE.

To the Senate and House of Representatives of the Commonwealth of Massachusetts.

Agricultural conditions in Massachusetts are steadily growing better, although the improvement is slower than many of us wish it to be. It is true that we are not cultivating as many acres as formerly, but on the other hand we are getting from the acres we do cultivate better results. There is also a decided tendency, both among business men and in the Legislature, to favor constructive work for and with the farmer. What is needed to-day more than any other one aid to agricultural development is the provision of organized agencies to help in solving the practical problems which the farmer has to face. Among such much-needed provisions are better selling agencies, particularly for milk; co-operative buying and selling organizations; a better system of farm finance; cheaper and more abundant electric power for use on our farms; better transportation facilities in rural districts; particularly more trolley lines and better roads.

Massachusetts land has got to be farmed, and is going to be; and if signs are read correctly we shall soon see in New England a marked return of population to our rural districts. There can be no reasonable doubt, however, that a large percentage of the permanent agricultural population of Massachusetts will be drawn from the old countries of Europe, the methods of thrift and economy of whose peasantry are more suited to the development of our kinds of land than are the habits of the native stock, who are more impatient of results. and are not willing to work so long hours nor to live under the hard conditions which seem necessary while developing a new country, — for many of our agricultural problems are really those of a new country. Large parts of our lands available for agriculture must still be cleared of trees and stones, and need to be drained or irrigated; and in many other respects, the same sorts of preparatory work are needed that were done by the first settlers of New England.

This resettling is already taking place on a large scale. We have seen the Polish people take possession of the Connecticut Valley within the past few years, and in certain of our hill towns Jews and French Canadians are taking up the land and making a living where our older settlers have failed. The Portuguese are rapidly acquiring land in Bristol and Barnstable counties; and in the not far distant future we may expect to see large settlements of still other nationalities in our State. The one thing that may still save the day for the native Americans on our farms is the use of more and better machinery and of better methods discovered by scientific study, for certainly no nation in the world has ever made such use of chemistry and mechanics in agriculture as has ours.

The whole question of repopulating our rural districts and of using our now unproductive land is an economic one. The great plains of the west would never have been populated if people had not seen how they could make money from the soil. Neither will Massachusetts agriculture advance in any considerable degree unless a sure profit can be obtained from the soil. Three initial steps must be taken, and taken at once. if we are to establish any definite and sane agricultural development in our State.

First. — The agricultural lands of the State must be put into such shape as to make them marketable to prospective purchasers.

Second. — A system of banking must be established whereby farmers may obtain money on as easy terms as other business men do.

Third. — There must be a large publicity movement started, similar to those inaugurated by other States, calling the attention of the whole country to our land and its resources.

Undoubtedly there has not been as widespread an interest in agriculture for years as at the present time. Our ever-increasing population has caused a corresponding increase in the amount of food consumed and in the proportion of our food supply that is drawn from distant sources. By these facts, together with the prevailing high prices of all food to the consumers, the public is being led to look more and more to the Massachusetts farmer for help in solving the very much vexed question of domestic economy. The public little realizes, however, that the increase of our population has been accompanied by no increase in the number of farmers of the State, and that there has been an actual decrease in the acreage farmed and the number of cattle kept. The great influx of immigrants does not, as formerly, seek the farms, but the newcomers now crowd the cities, or else are used on great enterprises, such as building railroads and buildings, becoming consumers instead of producers of food supplies.

Farm labor was never so scarce as now nor so unsatisfactory, although this year saw some improvement in some sections. It seems as if the farmer must be content with the very worst of our immigrants, after the manufacturer and the railroad man have had their pick. This situation might be helped in this State if there were established under this Board a bureau which would co-operate with the United States Department of Immigration, and keep in touch with the people who are coming into this country. At present many immigrants from agricultural sections of Europe, who should go on to our farms, go instead into mills and factories where they soon lose all desire to do the work for which they are most needed and best fitted. We need these people on our farms already developed, and also to take up and utilize our now idle farm lands. There seems to be no agency now in existence to give our immigrants any idea of the actual agricultural conditions. As a rule, immigrants are not able to go out and buy farms at once, nor would it be wise for them to do so. It would accordingly be the duty of the proposed bureau to see that desirable men were found places on good farms where they could spend a few years in learning our ways and the local conditions of soil, climate and markets that must be met to insure success. The immigrant, however, is not the only important factor in the problem. One thing must not be lost sight of in the whole great question, and that is the great desirability of turning many of our young people toward the farms of the State and, while so doing, of giving them an education which will fit them to carry on successful agriculture.

One thing to which I especially wish to call attention is the necessity not only of more fully conserving our soil fertility, but of practicing better methods of handling all the ingredients which go to build up our soils. The members of the American commission in Europe were much impressed by the way in which all manures and farm refuse were saved. The cement-lined manure pit, and the carefully protected compost heap, were considered as necessary on each farm as the farm buildings themselves, while with us the tendency is to stack the manure outside of the buildings on the ground, and far too often on a side hill where the best parts of the manure run away with the spring rains. This problem is becoming more acute as time goes on, and the sooner we realize that here lies the vital problem in the future of our agriculture, just so much sooner will we give our best attention to its solution.

The Year's Crops.

The past season in our State has been, from an agricultural standpoint, the most varied for many years. Some crops have paid very well while others have been almost a failure, and this goes to prove that, taking one year with another, diversified farming, particularly under our conditions, is much surer to yield a steady profit than when only special crops are grown. The market gardeners had a very poor winter, owing to the low price of lettuce and other greenhouse crops, but they more than made up for this during the late spring and summer months, when the prolonged drought reduced the volume of farm truck to a minimum, thus greatly enhancing the prices received for these intensively grown crops. As most of the market gardens are well irrigated, market gardeners do not fear a dry summer, and more and more of our farmers are also coming to see the value of some form of irrigation and are installing it on their farms. The onion growers of the Connecticut Valley in particular are using irrigation with great success, and crop increases of over 500 bushels per acre are recorded as the result of irrigation. The onion crop generally was light this season, and prices ruled high, so that on the whole the onion growers were well satisfied. The hay crop was very good on the average, sufficient rains in the spring and early summer having given the grass a good start, and in most places a good crop was harvested under splendid weather conditions in late June and early July. A very noticeable thing this season was the large percentage of clover which appeared in many mowing fields where no clover was sown. One very common explanation of this was the very mild winter of 1912 and 1913, causing clover to winter well. Another was the increased use of lime in Massachusetts, by which soils too sour for clover have been sweetened enough to grow this crop, which is certainly a very important one for our dairy farmers, although clover is not desirable in the timothy, or herd's grass, which is intended for horse hay.

The apple crop of the State was severely cut by the heavy frost of late May, when temperatures of 25° were recorded in many places, after the blossoms had fallen and the fruit had set; many apples which were not injured enough to fall were so marked as to reduce them to second and third grades. While the result was a very great reduction of the crop, still the apples in general were of fine quality and good color. Prices have ruled high, from $2 to $4 a barrel, but the very mild damp weather of October caused heavy losses in apples not in cold storage, and even those in cold storage were affected to a considerable extent. There is still a very wide interest in apple culture, and many are going into the business in a large way. Still, we have an abundance of splendid apple land in the State, and ample opportunity to enlarge. One pressing need of the apple situation is that of apple standards or grades, and your secretary believes that our farmers will never get satisfactory returns for apples until a standard is adopted both for barrels and for boxes. It is a mistake for growers to pack apples of any but fancy grades in boxes, for the public has come to believe that the box is an assurance of quality, and we must not in any way injure that impression. The adoption of the Canadian or Maine law, both as to barrels and boxes, would materially help the apple situation in this State.

A great deal has been said regarding the overplanting of the apple, but there does not seem to be much danger of this, for the demand for good apples is ever increasing, while the multiplying army of insects and diseases for the orchardist to fight is likely to quickly eliminate the untrained man who thinks he can grow apples by sitting in his office and depending upon others to do the work. No form of agriculture requires so careful, ceaseless attention as the growing of good apples, and there will always be a profit in the business for the skilled and painstaking orchardist.

The pear crop of the State was very large this year, and quite generally of good quality, although much of the fruit was small, owing chiefly to overbearing. In 1912 there were practically no pears in Massachusetts, and after a year's rest the trees attempted to do two years' work in one. Prices were satisfactory on the whole, and particularly for the late fall and best winter varieties, including the Bosc, Anjou, Dana's Hovey and Sheldon.

In spite of the late frosts, peaches were abundant and in most cases of very high quality. Our State has probably never raised better peaches than it did this year, and as most of them were sold locally, good prices were realized. While we have many splendid varieties of peaches here we still need one which is more adapted to Massachusetts conditions, — a peach of good quality whose buds will stand our winters better. We have plenty of fine land for peaches, and only require a hardy variety to make this State a great peach-growing one.

Plums and cherries where not injured by frosts were very good. It is to be regretted that more cherries are not grown in Massachusetts, as this crop is a most profitable one and can be grown with ease practically all over the State. The sour cherries are most in demand, and are also most easily grown.

Grapes while not grown extensively were especially good and sold well. There is no doubt that the grape crop can be made to pay in this State, provided, however, that high quality grapes are grown, as these are not to any extent affected by competition from other States.

Strawberries were badly injured by the frosts in most places, and the crop was reduced fully 70 per cent. Prices ruled high, however, and the growers were fairly satisfied with results.

Other small fruits are not grown in sufficient quantities to affect the markets materially, although we have splendid opportunities for growing all kinds, and enjoy particularly good markets for them.

The whole outlook for fruit growing is very encouraging and no branch of agriculture in our State now offers better inducements to the careful man.

Potatoes were a light crop in most sections, but the quality was good and prices have been very satisfactory.

General crops were good on the whole, but squash and other vine crops were short. Prices on all general farm crops have been high, and in most sections farmers have been well satisfied.

Farm Products of the State.

For the year 1909, according to the federal census of 1910, the leading farm products of Massachusetts were as follows: —

Milk and cream (sold),	$13,773.458
Hay and forage,	11,280,989
Vegetables (other than potatoes),	6,189,857
Eggs,	4,280,445
Cattle (sold and slaughtered),	4,068,926
Forest products,	2,668,410
Flowers and plants,	2,455,467
Fowls,	2,411,078
Potatoes,	1,993,923
Apples,	1,780,290
Corn,	1,372,144
Tobacco,	1,218,060
Swine (sold and slaughtered),	1,068,172
Butter and butter fat (sold),	1,063,859
Cranberries,	1,062,205
Horses and mules (sold),	836,441
Nursery products,	605,875
Strawberries,	495,438
Oats,	157,381
Peaches, nectarines,	138.716
Pears,	110,069
Maple sugar and syrup,	77,559
Raspberries,	55,757
Rye,	52,396
Sheep (sold and slaughtered),	45,524
Wool,	36,670
Blackberries,	31.454
Grapes,	30.858
Plums,	28.253
Buckwheat,	24.678
Currants,	19,904
Honey and wax,	19.176
Beans and peas (dry),	13,541
Cherries,	10.848
Barley,	7.177
Quinces,	5.754
Gooseberries,	5.007
Seeds (clover and millet),	4,454
Nuts,	3.671
Cheese,	3,610
Wheat,	2.515
Kaffir corn and Milo maize,	835
Mohair,	509
Apricots,	326

A glance at this table shows that we produced in 1910 more than $60,000,000 worth of agricultural products, and it is fair to say that now we are well above the $75,000,000 mark, although a study of the whole question proves that most of our crops, with the exception of cranberries, flowers and some vegetables, are produced for our own consumption. In other words, Massachusetts is not agriculturally an exporting State. In fact, most of the large amount of money we spend for agricultural products goes to other States, since we import about three-fourths of the agricultural products here consumed. This brings up the important question of the development of our now unproductive lands, of which we have an abundance in the State, and upon which might be produced a large proportion of the food we now buy elsewhere. Much of this land lies within easy reach of Boston, while large tracts are near other centers of population. To be sure, much of this land, when improved, would only be good for producing hay, but we need more hay in Massachusetts.

There is now an appropriation of $15,000 by the State for the drainage of wet land, and this Board is made responsible jointly with the State Board of Health for carrying out the purposes of the act. Some parts of the act are not practical, inasmuch as they require the State to work the land after draining, and to grow crops which can only be sold to State institutions. There is no question that the land, once drained, will grow crops, and while it might be desirable for the State to grow crops in this way as an experiment, it does not seem necessary. A better method of carrying on this work would be for the State to drain some large tracts of land and assess the costs on the landowners, spreading them over a long term of years where they are willing to pay, and where they are not, to buy the land and sell it again to those who want farm land. Prison labor should be used for reclamation purposes as the act provides, since often the labor in our prisons is not now utilized to its fullest capacity, and it would seem that this would be one of the best ways of using such help in constructive work. A bill covering the above recommendation has been prepared, and will be presented to the Legislature this year.

The work of the joint committee so far has consisted in looking over several tracts of land with a view to their development, but in most cases the expense would have exceeded the funds available. A survey has now been made of one large tract, and if reports are favorable, work will soon be begun on this place.

Dairying.

The rapid decrease of dairy animals in our State forcibly calls to our attention the unsatisfactory condition of the dairy industry, though to fully discuss the question would occupy more time and space than we can allow in such a report as this. Certainly one factor stands out prominently in the whole question, and that is that the farmer is not getting enough for his milk to return him a fair wage; and how can he be reasonably expected to continue in a business which brings no adequate return? The greatest decrease in the dairy business is in sections where farmers are shipping milk to large city contractors, principally Boston, while the smaller cities, such as Springfield, Brockton, etc., which are supplied from near by, have a fair number of prosperous and satisfied dairy farmers in their environs, although many of these towns are now bringing a good deal of milk from a distance, and conditions are not entirely satisfactory. The continued agitation of the milk question in the Legislature, together with the low price received by the farmers for milk, has had a great tendency to reduce the number of dairy animals kept. There is in fact at present a serious shortage of dairy cows, not only in this State but in all the eastern States, as is indicated by the fact that only recently carloads of dairy cows have been shipped from Brighton to New York farms. There would seem, in view of this shortage and the consequent high price of cows, to be a splendid opportunity for our farmers in more remote sections, where pasturage is cheap, to raise dairy animals, selling either butter or cream and using the skim milk or buttermilk for growing young stock. We are fast approaching a situation which can only result in one way in so far as our dairies and the dairy business are concerned, namely, that our dairy animals will have to be brought from the middle west at a greater expense, and consequently with a great increase in the cost of producing milk.

Our farmers are already finding it more profitable to grow fruit, vegetables, corn, or even hay, and ship these to city markets or to country towns where very few of these crops are grown. Our vegetables, in particular, go to supply the summer hotels of New Hampshire, Maine, Vermont, and Canada, while we receive milk from these sections where, as yet, the dairy business is about the only thing the farmers can do, although few of them are getting a satisfactory price for their milk. If the farmers of Massachusetts could get 6 cents a quart for milk at their farms, the cows would soon return to our State and there would be little heard about the dairy question. It is absolutely impossible to expect our farmers to produce a 10-cent article for 3½ or 4 cents. The public is now getting what it pays for and no more, and just as soon as there is a willingness on the part of the consumer to meet the farmer half way, our cities will be supplied with plenty of clean, fresh milk.

Undoubtedly the solution of the milk question, and in particular that which bears on the product itself, will never be settled until milk is paid for on its merits, and your secretary firmly believes that there will be no great improvement in the product until a system of grading and standardization is adopted whereby the product and not the dairy will be the important item. Along with such a change in our present system there will have to be established milk stations where tests will be made and the farmer paid according to the quality of the milk he produces.

A paragraph from the report of the secretary of this Board in 1884 is interesting in that it shows that the milk question is no new one: —

> The production of milk to supply our towns and cities is a branch of husbandry that in late years has not been satisfactory; the farmers have allowed shrewd contractors to control the supply and sale of milk, and have accepted prices lower than the cost of production.

The Hay Crop.

The great question of supplying cheap forage for our cattle will never be solved until we realize that we are growing a smaller hay crop per acre than is commensurate with profitable agriculture. The average for 1912 was less than 1¼ tons per acre, with a value of less than $27, and yet the high prices for hay which have prevailed the past five years ought to have stimulated the growing of better crops of hay. The greater part of our hay land is capable of producing over 4 tons per acre, and while much other land is light, and suffers during a dry season, yet with proper care even this should produce 2 tons per acre. Many of us are apt to think that hay land will go on producing indefinitely without anything being returned to the soil, not realizing that once a hay field is well started the application of a few dollars' worth of fertilizer each year will often more than double the crop. The proper top-dressing of our hay lands each year should be a more regular practice on our farms, and this with the use of modern hay tools would materially reduce the cost of producing hay. Too much stress has been laid on the need of large barns for hay storage. Many of us would be better off with smaller barns, using Dutch barns or open sheds for storing hay. The costly upkeep of buildings on many of our New England farms has discouraged the second and third generations from continuing on the farms.

Alfalfa.

We have heard a great deal during the past few years about growing alfalfa in Massachusetts, and a greater interest than ever before is being manifested in this crop. Certainly the successful cultivation of it will have much to do in solving the dairy question. We have quantities of land suited to the growing of this crop, and yet at the present time there are only about 300 acres actually planted and producing in the State. Four crops a year have been cut from many fields, with an annual average of 5 tons of dry hay per acre, although in most cases the crop is used to feed green. Many experiments are being tried in the use of alfalfa as a silage plant, and best results have been obtained when wheat or rye has been sown with the alfalfa. The first cutting of alfalfa and rye or wheat may be put in the silo if conditions are bad for curing hay.

There have been formed quite a number of alfalfa-growing associations or clubs during the past season, among which are the Worcester County Alfalfa Association, the New England Alfalfa Growers' Association and the Connecticut Alfalfa Growers' Association, thus showing that there is a lively interest in the question, and that steps are being taken to grow the crop in a large way. There is no reason why our lighter soils should not be used to grow alfalfa, as there is a ready sale for the product at good prices, and no better food for dairy animals has yet been discovered. It is difficult at present to obtain good seed, but we hope soon to have an abundant supply either from the government, which is conducting some splendid experiments, or from private sources where good seed is recognized as the most important factor in growing the crop.

SHEEP.

One often wonders, while going over our State, why more sheep are not raised, and when the question is brought up for discussion one generally gets the answer that dogs are the chief reason why the farmers do not raise sheep. There is no doubt that dogs do destroy many sheep; but if the business is, or could be made, profitable is it not a fair question to ask why dogs are allowed to ruin the sheep business any more than the San José scale or other insects are allowed to ruin the fruit business? No doubt the sheep business is not profitable as at present conducted; but if enough farmers could get together and pool their pastures and engage a man to care for the sheep in large flocks, there would seem to be a fair opportunity for profit in the business. Much land remote from markets should be used for this purpose, while crops could be grown for winter sheep food that would not pay if grown for distant shipment. Sheep are being raised in England, Scotland and Wales on much more restricted areas than here, although their dogs out-number ours five to one. While dogs there do destroy some sheep, yet the number is so small under their system as to be only a fraction of the loss from other causes.

It would seem reasonable to suppose that what other countries, with no better facilities than ours can do, may be done here. At least, the experiment is worth trying. It is certain that sheep greatly improve pastures and make them capable, after a few years, of feeding more cows on the same acreage; for they not only eat many plants and bushes which the cattle will not touch, but their droppings have also a decided fertilizing value.

Beef Cattle.

There is a decided feeling among many of our farmers that the time is ripe to again raise beef cattle in our State, and it would seem that with the high price of beef, together with the increasing demand for such food, many of our now idle pastures might easily grow many beef animals. Particularly so would this seem possible in districts remote from railroads and transportation facilities, where it would be next to impossible to get perishable farm produce to market at a profit. The industry has got to be built up from the bottom, however, and it will take many years to establish it on a profitable basis. The beginning has got to be made, nevertheless, and soon, if we are to supply the demand. Many seem to feel that as soon as they get well established in this business price will drop so that there will be no profit. This has not been the case in older countries; in fact, prices have advanced there, and are as sure to do so here.

Legislation of 1913.

The recommendations of the Board for legislation met with generally favorable consideration by the Legislature.

Chapter 260, Acts of 1912, was amended so as to provide for a more general distribution of the bounty to children and youths. An appropriation of $1,000 was granted the Board for the encouragement of agriculture and practical home arts among boys and girls. The date on or before which the returns of the agricultural societies drawing bounty shall be filed was changed from January 10 to December 10, next preceding, so that the financial year of the societies might conform to that of the State. An appropriation for a deficiency in appropriation for publishing the special report on "A History of Game Birds, Wild Fowl and Shore Birds" was granted. The appropriation for incidental and contingent expenses was increased $100. A bill, not submitted by the Board, increasing from $1,000 to $2,000 the poultry premium bounty, was enacted into law.

The only recommendations of the Board which did not become law were the following: an act providing for an open season on pheasants and allowing farmers or other persons to destroy pheasants found injuring cultivated crops; an act to provide for the collection and distribution of information in regard to farms for sale and the agricultural resources, advantages and opportunities of the Commonwealth; and an act that the annual appropriation for the use of the Dairy Bureau be increased from $8,000 to $10,000.

Milk Legislation of 1913.

The recommendation of the Board that an annual appropriation of $15,000 for three years be made for the encouragement of practical dairymen was made a law, with a reduction of the appropriation to $5,000 per year. An act to safeguard the public health against unclean milk containers and appliances used in the treatment and mixing of milk was also placed on the statutes.

Changes in the Board.

The expiration of terms alone resulted in the following changes in the personnel of the Board: Mr. Ernest W. Payne, of the Deerfield Valley Society, retires after three years of service, and Mr. David T. Barnard has been elected to fill his place; Mr. Harry A. Ford, of the Hillside Society, retires after three years of service, and Mr. Harry L. Packard has been elected from this society; Mr. Augustus Pratt, of the Plymouth County Society, retires after twenty-four years of service, and Mr. Ernest Leach of Bridgewater has been elected to the Board in his place; Mr. Burton W. Potter, of the Worcester Society, retires after six years of service, and Mr. Edward A. Waters has been chosen to fill his place; Mr. John L. Smith, of the Worcester County West Society, retires after six years of service, and Mr. James A. Rice has been elected from this society. The retirement of Mr. Pratt removes from the Board one whose close interest in, and sympathy with, the work of the Board, rendered unselfishly throughout a long period, makes his retirement all the more regrettable to all those who have known him. The resignation of Mr. J. Lewis Ellsworth, after ten years of service, as secretary of the Board, and the election to this position of Mr. Wilfrid Wheeler, delegate from the Massachusetts Horticultural Society, left a vacancy in the representation from this society which has been filled by the election of Mr. Edward B. Wilder. The West Taunton Agricultural Society, which has applied for bounty, has elected as delegate Mr. Charles I. King.

Work of the Office.

The demands on the office force of the Board have increased faster than provision could be made to meet them, and consequently it has been impossible to carry on some phases of the work. The loss of the second clerk, Mr. Erwin H. Forbush, who in August, after service of a year and a half, resigned to accept a more lucrative position at the Massachusetts Agricultural College, has been keenly felt. Mr. Forbush's training and experience had fitted him to carry on the editorial work of the office in a most efficient manner, and he was urgently requested to continue. The difficulty presented in this case makes it seem advisable to recommend such a redrafting of the law as to allow the employment of a second clerk at such a salary, to begin with, as may be necessary to secure a proficient man, leaving opportunity for an occasional advance. Surely a new man, unacquainted with the details of the office, is not worth the maximum salary due him after a term of years. As the Civil Service Commission was unable to certify any one to fill the position of second clerk, there was held in October an examination of 41 candidates. At the end of the year no report of this examination had been made. Mr. J. C. Goldthwaite of Chester, Vt., has been employed provisionally for the last four months.

The necessity of having a stenographer in the office who could give her entire time to this work was met in the spring by the employment of Miss Josephine W. Riley. As the appropriation for lectures before the Board and extra clerical assistance was insufficient, Miss Riley's salary has been paid from the appropriation for the dissemination of useful information in agriculture. It is manifestly undesirable to be obliged to draw for clerical assistance on this fund. For this reason, and in order that the clerical force of the entire office may be consolidated, it is recommended that an appropriation of $5,000 be made for this object alone. Then the expense of lectures before the Board should be paid for out of the dissemination appropriation.

Meetings of the Board.

The summer field meeting of the Board was held, at Barnstable, July 31 and August 1, in connection with the State Grange. There was a splendid attendance; the day was fine, and a few exhibits of farm tools and machinery served to attract the people considerably. The following speakers presented subjects of interest to Cape Cod: Prof. J. C. Graham on poultry and Dr. H. J. Franklin on cranberries.

The morning session was conducted by the Board, and the afternoon by the Grange. Many of the Board members visited several of the cranberry bogs in the vicinity, which are unusual sights to those living in the western part of the State.

The winter meeting was held at Springfield, December 2, 3 and 4, in the municipal building, in conjunction with the Hampden County Improvement League, the Massachusetts Dairymen's Association, the Massachusetts Milk Inspectors' Association and the New England Alfalfa Growers' Association. This combination of enthusiastic workers for agricultural progress resulted in one of the largest and best meetings that the Board has ever held. Every one worked with a will to make the meeting a success, and the added attractions of the Dairy, Corn, Children's and College exhibitions, together with splendid exhibits from the various manufacturing companies, left little to be desired in the way of an agricultural gathering.

The following topics were discussed: poultry, seed, milk, apples, farm management, dairying, boys' and girls' club work, home improvement, club work, rural credit, banking, co-operation and alfalfa. It is hoped that copies of the discussions on these subjects will soon be printed in pamphlet form.

The attendance at all sessions averaged 200, and a very great interest was manifested. Certainly the members of the Board, and those attending the meeting, will long remember the cordial reception given them by the Springfield people, and have carried away many pleasant memories of a meeting full of interest and optimism for the future of our agriculture.

Farmers' Institutes.

Your secretary has given a good deal of thought to the question of Farmers' Institutes and meetings of this sort, and one thing seems to stand out prominently if the future institutes of the Board are to be a success. We need some one who can conduct these institutes as a circuit, and I recommend that the Board employ a man capable of doing this sort of work to make up the list, which shall be widely published, and attend to the advertising and other necessary detail, so that the institutes shall be a success. In so far as it is practical, all institutes should be held in connection with the local agricultural organizations, granges, etc., and an all-day meeting held, in which topics dealing with the section may be discussed.

In so far as possible these institutes should be practical demonstrations or illustrated lectures on the various subjects. The poster which the Board has voted, and of which we now have a good supply, should aid materially in attracting attention to these institutes. We are having more calls for speakers than we can attend to with our present appropriation, and if all the demands are to be met a large appropriation will have to be obtained. Our money for institute work is now drawn from the dissemination fund, and with such demands from all sources upon this fund it is impossible to do the work without more money. An increase of $2,800 is asked for this year.

The institute work of the year was carried on as usual. There were held 144 institutes with 174 sessions, there having been more two-session institutes than ordinarily. All the societies held three or more meetings except the Eastern Hampden, which held one, and the Hampshire, Hoosac Valley, Middlesex South and Quannapowitt societies, which held two each. Eight societies held four or more meetings, and 38 institutes were held by organizations other than the societies represented on the Board. The aggregate attendance for the year was 20,017 persons, or 115 per session, as against 118 last year, 126 in 1911, 110 in 1910, 137 in 1909, 111 in 1908, 118 in 1907, 127 in 1906, 125 in 1905, and figures ranging from 94 in 1899 to 109 in 1904 for previous years.

The addition of a subject list to the published list of speakers seems to have been of considerable assistance to those in charge of institute work.

Boys' and Girls' Agricultural Work.

The $200 granted two years ago to each agricultural society in the State had an immediate effect in stimulating agricultural societies among the boys and girls of the State. In sections where there was active co-operation on the part of the school people with the fair officials the exhibits have been large and excellent in quality.

The $1,000 appropriated last year for State work has been used in promoting a more definite type of home projects in potato, corn and market-garden work, also encouraging the cultivation of small back-yard gardens by those who did not have larger areas.

Cups were offered to cities and towns in which the boys and girls did the best agricultural work. Brockton won first prize, and Worcester second, in the city contest; Hadley won first, and Groton and Methuen tied for second place in the town contest. Cash premiums were offered the schools doing the best work. Among the larger schools, the Mark Hopkins School, North Adams, won first prize; Central Grammar, Hadley, second; Southworth Street School, Williamstown, third; Marshall School, Brockton, fourth; and the grammar school at North Hadley, fifth. In the rural school contest, Russellville School of Hadley won first prize; Chicopee School, Groton, second; West School, Hadley, third; New Boston School, Hadley, fourth; and the Moors School, Groton, fifth.

There were 190 entries in the market-garden contest, 193 in the potato contest, each planting at least one-eighth acre; 39 entries in the one-half acre corn, and 25 in the acre corn contests. More than 75 per cent. of those who entered planted the area, cared for and harvested a crop. Many applied scientific methods, and although the season was poor had excellent results. These contestants were grouped into two corn clubs, four potato clubs and one market-garden club. The 7 winners were given a free trip to Washington, D. C., where they met champions from 29 other States where similar work is being done; the 7 winning second place will be given a free trip to some place of agricultural interest in New England; and the third prize winners will spend a week at the Massachusetts Agricultural College, where a special program will be prepared for them.

At the State exhibit held at Springfield, over 150 exhibits of pecks of potatoes, plates of potatoes, ten-ear exhibits of corn, single ears and exhibits of garden products were made by these young agriculturalists. It was a large and excellent display that attracted much attention and favorable comment.

Your secretary feels that the boys' and girls' department is a very important one, and that it should receive encouragement and financial support. It would seem that the full amount of $3,000 asked for last season should be granted this year by the Legislature.

The complete list of the winners of rewards follows: —

1. Fordyce Anderson, Plainfield,	$45 00
2. Whitney J. Bent, Maynard,	1 00
3. John E. Blodgett, Holland,	1 00

4.	Harold A. Bolles, Wilbraham,	$6 00
5.	Orin Butcher, Concord,	30 00
6.	John R. Callahan, Hadley,	6 00
7.	Harold F. Campbell, Brockton,	12 00
8.	Elbert A. Chapman, Montgomery,	9 00
9.	Walter T. Clark, Granby,	52 00
10.	Harold L. Cobb, Bernardston,	35 00
11.	Nelson M. Colkins, Rutland,	2 00
12.	Chas. Depoyan, Bridgewater,	42 00
13.	John K. Devine, North Hadley,	63 00
14.	George Enderson, Hadley,	5 00
15.	George Erickson, Brockton,	10 00
16.	Howard Estes, Windsor,	15 00
17.	Lawrence Estes, Windsor,	40 00
18.	Thomas J. Glasser, Uxbridge,	30 00
19.	Henry Graves, Plainfield,	2 00
20.	Cleon Hammond, Abington,	45 00
21.	Robert E. Hanifin, Belchertown,	7 00
22.	Warren Hapgood, Framingham,	19 00
23.	Ferdinand J. Ice, Williamsburg,	20 00
24.	Frank Kokoski, Hadley,	3 00
25.	Donald Lunt, Maynard,	2 00
26.	Joseph Kokoski, North Amherst,	1 50
27.	Carlton D. Macomber, South Westport,	1 00
28.	Gordon B. McKay, Brockton,	16 00
29.	Spencer Merriam, Westminster,	31 00
30.	Ellery M. Metcalf, Saugus,	40 00
31.	Ethelwyn H. Moore, Worcester,	28 00
32.	Newell W. Nichols, Sturbridge,	12 50
33.	Kenneth Nickerson, Harwich,	1 00
34.	Eldon Packard, Brockton,	8 00
35.	Edward Parsons, North Amherst,	3 00
36.	Roger E. Peck, Shelburne Falls,	4 00
37.	Wm. C. Pierce, Jr., Lincoln,	50 00
38.	Elizabeth Root, Easthampton,	17 00
39.	Kenfred Root, Easthampton,	21 00
40.	Walter Root, Easthampton,	12 00
41.	Center Grammar School, Hadley,	20 00
42.	Chicopee School, Groton,	20 00
43.	Mark Hopkins School, North Adams,	25 00
44.	Marshall School, Brockton,	10 00
45.	Moors School, Groton,	5 00
46.	New Boston School, Hadley,	10 00
47.	North Hadley Grammar School, North Hadley,	5 00
48.	Russellville School, Hadley,	25 00
49.	Southworth Street School, Williamstown,	15 00

50. West Street School, Hadley,	$15 00
51. Catherine Slein, New Braintree,	40 00
52. Alexander Smith, Westport,	2 00
53. Chester A. Smith, Hadley,	19 00
54. Clifford Stetson, Plainfield,	1 00
55. Wm. P. Strong, Holyoke,	3 00
56. Ralph Walker, Marlborough,	40 00
57. Lloyd White, Ludlow,	1 00
58. Warren W. Wetherbee, Stow,	29 00
59. Chas. C. Wilson, Warren,	5 00
60. Edward F. Wilson, Warren,	5 00

The New England Fruit Show.

This organization held a very successful show at Horticultural Hall this year, and was materially assisted by the Board, which offered prizes for Massachusetts-grown apples, pears, etc. The whole exhibition was the best ever staged in the east, and it is even doubtful if anywhere in this country a better show has ever been brought together. Owing to the late frosts, which reduced the apple crop to a large extent, there was not as much fruit in the halls as at the show of 1911, but certainly the better quality and packing of the fruit made up for the lessened amount. The box fruit was particularly fine and showed conclusively that the work begun and maintained by the New England Fruit Show has had its effect to a marked degree in this direction. The Board, in bringing Mr. Castner from the west at the last show, certainly did a splendid thing in demonstrating the great importance of proper packing of apples. The Massachusetts Fruit Growers' Association also did some splendid work in collecting a noncompetitive exhibit for Massachusetts of over 200 boxes, and the expenses of this exhibit were borne by this Board from its special prize appropriation.

Corn Show.

The Board held a corn show in connection with its winter meeting at Springfield, and while only $300 was offered in prizes, yet a very fine exhibition resulted, in spite of the fact that never has there been in recent years such an unfavorable season for corn growing in Massachusetts. The late frosts of May killed much early planted seed, while a very severe frost on the night of September 12 damaged a large amount of the unripened grain; with these two disasters, added to the wet weather of October, one wonders how any corn was matured in the State.

All classes were well competed for. Flint corn was, on the whole, harder than dent, but some very fine dent was exhibited. Professor Taylor of Durham, N. H., judged the contest. The money for prizes and ribbons for this show was drawn from the special exhibition appropriation.

WILD DEER.

So much complaint has been received by the Board and also by the Fisheries and Game Commission that it would seem advisable for the State to enact some drastic law regarding these animals which are such a menace to the orchard industry.

The State paid $19,977.29 to our fruit growers for damages by deer in 1913, but this money does not in any way compensate for losses sustained.

A bill, indorsed by many of our farmers in the western part of the State, will be presented to the Legislature this year, calling for a longer open season on deer, and also giving to the farmer the right to use the meat of the animals he may kill.

The only way we can hope to get relief from this deer nuisance will no doubt be by the extermination of them, but how best to accomplish this result is difficult to decide. Certainly one thing is necessary, and that is to prevent deer from private parks escaping to our wild lands, and a law requiring all private-deer parks to be fenced will be absolutely necessary. Massachusetts should never become a reservation for deer, and any law looking toward the abatement of this nuisance would be acceptable to this Board.

MASSACHUSETTS DAIRYMEN'S SHOW.

This recently organized association is doing splendid work in dairying, and this year the Board has given it $560 for show purposes. The association has held two exhibitions, one at Brockton and one at Springfield. The show at Brockton was not as large as expected, but the time was too short to properly prepare for it. At Springfield ample time was allowed, however, and through the efforts of the Massachusetts milk inspectors and the Hampden County Improvement League, working in conjunction with the Dairymen's Association, the large number of 207 samples, representing every section of the State, were brought together for competition. This is the largest milk show ever recorded in this country, and the success goes to prove that when all agencies work together a great interest can be aroused. The samples scored very high in nearly all classes, and one very significant fact was that where milk from expensively constructed dairies was brought in competition with that from ordinary barns, the rule was that the ordinary barn milk won the prizes, thus showing that the man is the largest factor in clean milk production. The Board furnished some very attractive ribbons, together with money, for prizes at this show.

Nursery Inspection.

This very important work has gone on satisfactorily this season, and the continuance of it seems more than ever necessary, not alone to check the spread of the various insects within the State and from our own State to others, but also to prevent the importation of dangerous insects from elsewhere. At the present time every shipment of plants, etc., coming into Massachusetts from foreign countries is examined by our inspectors, and if any suspicious insect or disease is found, the shipment is either destroyed, fumigated or quarantined. Just one example of the value of this work. On one shipment of trees from Japan last spring, our inspectors found no less than twelve insects of various kinds, many of them new to our country, as well as three dangerous plant diseases. Needless to say the shipment was destroyed. If this sort of work had been begun twenty-five years ago we would not now be fighting the gypsy and brown-tail moths, and the value of this preventive work cannot be computed in dollars and cents. In the case of the Japanese shipment, if only one of those insects had proved to be a bad one, it might cost the country millions of dollars in a short time.

Other States are making more stringent laws all the time regarding nursery shipments, and our nursery inspectors have got to meet this by more careful inspections, so that there will be absolutely no danger of shipments of dangerous insects to territories now clean. The Colorado potato beetle, under no inspection, spread with amazing rapidity all over the country, while we have had the gypsy moth for over twenty-five years, and it is still confined to New England, owing to our stringent laws and the good work by those charged with their enforcement.

Insect Pests.

There have been quite a number of serious outbreaks of insects during the past season, the tent caterpillar and brown-tail moth being the worst offenders. There is no doubt that the tent caterpillar has been getting worse and worse during the past few years, and the outbreak of this year is only an inkling of what we may expect this coming season unless some of this insect's natural enemies rise up and keep it down. All over southern New England this insect made the landscape hideous with its stripped trees and unsightly nests. Apple trees, wild cherry, peach and plum are its natural food, and where no spraying was done the insects had a free course. In order that the damage may not be repeated this year, and to lessen the chance of these pests spreading, all wild cherry trees should be cut down, as well as all apple trees which are not going to be cared for by the owners. Many of the wild and old pasture apple trees which stand too far from the home farm to pay to care for would much better be turned into firewood than left to act as a feeding and breeding place for these insects.

The forest tent caterpillar was also bad in some places, where their work is often mistaken for that of the gypsy moth. Very serious damage was done late in the summer in some locations by the brown-tail moth, and there seems to be no end to the spread of this creature. In the forester's report will be found more complete details regarding both this and the gypsy moth.

Orchard insects have been numerous this season, in particular the codling moth and railroad worm. Seldom have we had such an outbreak of the former, which this year appeared in larger quantities the second time than it did the first. In many places where a second spraying was not made the small apple crop was further badly reduced by this insect.

Scale insects seem to be held fairly well in check by most orchardists. Indeed, this insect regulates itself fairly well, for where it is neglected by the orchardist it soon kills the trees and consequently itself. There is, however, grave danger of its spreading further on many ornamental shrubs and trees, such as dogwood, Japanese quince, mountain ash and lilac.

Insects on vegetable plants were not as numerous as usual, although the asparagus beetle was much in evidence during the early part of the season. Aphids and plant lice were bad on cabbage and cauliflower. One very hopeful thing in connection with all insects is that where their natural parasites are abundant very little damage is done, but let their parasites be reduced materially and serious outbreaks are sure to follow.

Roads.

The road question in the State is getting to be more serious each year, for with the increased automobile travel all roads are receiving very severe wear. The burden of building good, new roads comes very hard, even on the well-to-do towns, and is practically impossible in the hill towns where good roads are absolutely essential to development. Not only does the small town need good roads to get its products to market, but fully as important are good roads in bringing the people to the towns. There should be a system of State highways connecting all of the hill towns, but the towns themselves should make good roads to connect with the State roads. This last season the State built about 60 miles of State highways in conjunction with towns, under the small towns road act, thus assisting nearly 90 towns, and about the same amount of work is planned for the coming year; but this is not enough to make travel safe and easier in the hill towns. Many of these will be denied the service of the trolley for years, and in the meantime good roads should be constructed. The bill introduced last year, but laid over for consideration by the incoming Legislature, designed to give towns aid in constructing roads, is, in the opinion of your secretary, worthy of notice. This bill provides a State official to supervise the construction of roads in small towns where two or more of them can unite, and as much money is now wasted in constructing poor roads it would seem as if the passage of this bill would materially aid the situation. Certainly good roads are the first essential to the repopulating of our hill towns.

The Agricultural College.

At the present rate of growth our agricultural college will soon need many new buildings. In fact, some are absolutely necessary at once, and it is to be hoped that the Legislature will grant the money to build those most needed this year.

The college is keeping in close touch with all the advancement in agricultural education, and while it may be doing its best to keep all departments in the highest state of efficiency, there are some of the practical courses which need better instructors and investigators, chief among which is the market-garden course. This seems to have been neglected more or less lately. We need the best instructors in this course, as Massachusetts should produce double the amount of market-garden crops that she does at present, and what is more important is the need of our market gardeners from time to time of help in solving their many vexing problems.

It would seem that in the rapid expansion of the college in the past few years some practical subjects — the teaching of which is most important — have been lost sight of, and now that agricultural expansion has pretty well covered the State it would seem advisable that greater attention be paid to the development of the plans already laid out, looking particularly toward a very strong central organization at the college, where not only students will receive the kind of instruction which will fit them to carry on the farms of the State, but where also our farmers and gardeners can from time to time get inspiration and help.

The very pleasant relations of the Board and the college have existed this year as formerly, and many of the college instructors and professors have supplied our institutes with splendid lectures on subjects of interest to the farmers.

Electricity and Agriculture.

Undoubtedly no one thing would do more toward solving many of our agricultural problems than cheap electric power for our farms. Electricity to light the farm home and farm buildings, to cut the silage and run dairy apparatus, to turn the washing machine, to heat flatirons, cook and do a hundred other things in the home would lessen much of the drudgery of farm life and serve to make the life of our brave, patient farm women lighter and give them more of an incentive to encourage their boys to stay on the farm and their daughters to marry farm men.

We have many streams and ponds in our State capable of developing much power, and where towns are themselves not able to put in the necessary plant private capital should be urged to do so, or the State furnish the necessary means to develop the latent power.

Conference of Organizations.

At the suggestion of the president of the agricultural college and vote of the trustees, the Board passed a vote at the last annual meeting, calling a conference of the various organizations interested in agricultural work in the State. The organizations represented were: the Agricultural College, Board of Agriculture, Boston Chamber of Commerce, the Massachusetts State Grange, the Board of Education and the Massachusetts Society for Promoting Agriculture.

Two meetings of this conference have been held, the first one at Amherst, where four organizations were represented, and the second at Boston, with five of the organizations represented.

Questions discussed were the relative functions of the various organizations, and in particular those of the college and the Board of Agriculture. It was agreed at the first meeting that President Butterfield and your secretary should draw up statements regarding their views of the work of each organization. These reports have been drawn up, but owing to the absence of President Butterfield that of your secretary has not as yet been submitted.

Apiary Inspection.

The work of this department has been very thorough this year, although the small number of inspectors, the small appropriation and the large field to be covered has made it well-nigh impossible to visit all places. That there is a growing field for this work would seem apparent from the fact that we are getting calls from all over the State for examinations of apiaries and instruction in beekeeping. The usefulness of the bee in pollination of fruit blossoms has not been appreciated, and we should keep more bees in the State if only for this purpose.

State Ornithologist.

Very few people recognize the important work that Mr. Forbush, our State Ornithologist, is doing, not only for Massachusetts, but for the whole country. His splendid work in connection with the recently passed federal laws, enacted to save our migratory birds and to protect in other countries the fast vanishing species of rare and beautiful birds, places him in the front ranks of those who have devoted their life's work to a worthy cause. Birds have not been given their true value in our economic life as insect destroyers, and the only reason that the gypsy and brown-tail moths are not held in check by birds is that there are so few birds and so many other insects on which they are used to feeding that as yet they have not learned to eat these insects. Increase the number of birds and the insect pests will soon be taken care of. The new edition of Mr. Forbush's book, "Useful Birds and their Protection," has come from the press, and brings this very important work up to date in all essentials.

Mr. Forbush has this year refused a very attractive offer to go to Washington on a salary commensurate with his services, but has decided to remain in Massachusetts. At present he is receiving only a very small salary, and it would seem to your secretary, in view of what he has given to the State in the past, and hopes to give in the future, that his salary should be increased to at least $2,000. I therefore recommend that this increase be granted.

The State Forester.

Under the direction of State Forester Rane the work of destroying and keeping in check the gypsy and brown-tail moths is going on with a fair degree of success, but the magnitude of this problem cannot be realized unless we consider the large area over which these pests have already spread. This department is working with the United States Department, who are attempting to keep the infestation confined to New England, but it is apparently an uphill fight, and the moths will sooner or later spread to other States unless in the meantime some parasite or disease is found to control them. As a rule, the cities and towns of eastern Massachusetts were kept quite free from serious inroads of the pests this season, but many tracts of woodland were badly stripped.

The work of reforestation is going on wherever land is acquired. Forest fires are being controlled to a greater degree, and in co-operation with towns and cities the forester is trying to work up a sentiment toward town and municipal forests. The Massachusetts Forestry Association is much in favor of a plan for State forests, and this together with the State Forester's plans ought to work out satisfactorily, so that land which is worthless for agriculture might be used for State forests.

Wasted Agricultural Resources.

One thing which Massachusetts has to contend with, and which should be brought to the attention of all of us, is that much of her best agricultural land is now in the hands of people who do not use it for agricultural purposes, or even if they do, the products generally go to satisfy some fancy farming scheme, and are not materially used in the general market. The holdings of these people are becoming greater and greater each year. Our farmers seem willing to sell their places at the rather attractive prices offered them, not realizing that the amount of money which they might receive for their farm put out at interest would not give them the kind of living that they had on the farm. Another phase of this situation is that many of these holdings by non-agricultural people are within a short distance of the cities, and are in many cases the old farms from which the cities got their milk supply. This is more true of Boston than of the other cities, and now Boston is suffering from what might be termed, for lack of a better name, long-distance milk, and in many instances the very people who are most concerned about Boston's milk supply are either living on or own one of these farms which have been withdrawn from the producing line.

Another side of the question which should be considered has to do with the cultivating of land which is being held near large cities for speculative purposes. This land should not be allowed to be idle, as it is in many cases for years, but should be rented to desirable persons who would use it for growing their own vegetables and fruit. Many city lots are now being used in this way, but I refer more particularly to land lying immediately outside of cities. If our people from mill towns could but use this land and grow on it a part of their own food, there would be less talk of the high cost of living and the red flag would disappear from the streets of our mill towns.

The Dairy Bureau.

This Bureau has conducted its work in the same efficient manner as in the past, and under its able general agent cases of fraud against the dairy laws have been prosecuted. The relations between this Bureau and the Board have been harmonious; so much so that the Board has placed the appropriation of $15,000 for the encouragement of dairying in its hands, and the report of the Bureau will state what use it has made of the money.

Your secretary feels that the Board, through its Dairy Bureau, has widened its influence to a marked degree, and particularly so in the system adopted for the distribution of this appropriation. We need more constructive work in dairying at the present time, and certainly no work done along dairy lines has resulted in so much favorable comment as has this.

Fairs.

A good many of the fairs had bad weather for at least part of the time, and some were unfortunate enough to have bad weather over their entire dates. This, of course, cut down receipts in many cases and made it difficult for the societies to meet their obligations. There has been a tendency for some of the fairs to go along the lines followed for years in the offering of premiums and in the general conduct of the show, and it would seem that the time has come for some material changes to be made if we are to meet successfully the demands of our times. It would seem that, first, our fairs should be more predominantly agricultural; the tendency of some fairs toward the industrial and sporting side seems to indicate a belief that the community does not wish to have agricultural fairs. Then, also, there is a tendency to make too much of the so-called fakirs' row and attractions of like nature, which, although allowed on the grounds by the State police, do nothing to serve the cause of agriculture except by bringing a small revenue to the association. This small revenue might be made a large one if the fairs would adopt some better form of attraction, which might take the form of a moving-picture show in some sections, while in others, pageants, depicting the history of the town or section, might be advisable.

The question of premiums also is a most important one, and many are inclined to think that we have arrived at the time when it would be best to offer large prizes for the best crops grown in a given section, or the best conducted farm, making it a condition that a liberal amount of the crop or the products of the farm shall form a feature of the fair. The standardization of the premium lists and exhibits of our fairs is desirable, and to this end there should be a list of judges acceptable to the Board, who alone should be allowed to judge, and it should be their particular duty to see that no unworthy article is awarded a prize.

A certain percentage of the money paid to the agricultural societies should be awarded as State prizes for the best fruit, vegetables, poultry, animals, etc., in each class, and ribbons suitably inscribed be given in connection with the money. These ribbons should be awarded only in limited numbers and to only the very best objects.

THE POULTRY OUTLOOK.

The same plan should be applied to poultry exhibits, making the State prizes a distinct feature, and paying prizes only for best birds in a few good classes.

The demand for an increased production of poultry and eggs has been so great that the methods of care and management have not kept pace with it. Especially is this true of intensive poultry keeping. The poultry business not being yet reduced to an exact science, many suppose that it is possible to get a particular breed of fowl that will give a high egg production irrespective of other conditions; yet in poultry contests no one breed takes the lead, and in the investigational work carried on at the various stations and colleges, breed or variety do not appear to be specially important. The poultry house is no doubt a very important factor, but there are many who seem to suppose that more depends upon the house than anything else. Many poultrymen think the modern type of house is not automatic enough, and are looking also for one that will house from 500 to 2,000 in one flock as efficiently as we can house 25 to 100, imagining that in such a house hens will lay in spite of the conditions that naturally result from overcrowding.

There are other people who pin their faith on some particular kind of feed, patented or otherwise, that will make hens lay regardless of their breeding, housing, general care and management. So strong is the belief that some such feed can be found, that thousands of dollars are still being wasted every year in this State in buying patented feeds and many so-called poultry foods that are not in themselves foods at all. But condiments and stimulants have about had their day in the poultry business.

Many experiments have been carried on at our various agricultural experiment stations to determine the value of certain types of houses, feeds, etc., but in almost every case it was found that more depended upon the individual hen than on the house or the feed. This naturally led to a study of the hens themselves, irrespective of the house, feed or variety. So we now have our tested hen just as the dairyman has his tested cow. She is tested for egg production, fertility, hatchability of eggs and viability and growth of chicks.

It must be kept in mind that we are not belittling the breed, the house or the feed. We consider these important factors in poultry culture, but we believe undue emphasis has been laid upon them in the past. They are simply tools in the hands of the poultryman. What is of much greater importance than the particular tool selected is that these tools are handled by men who possess considerable knowledge and skill. In other words, success in poultry keeping depends largely upon the human element involved, the same as in any other line of effort.

Co-operation.

We are at present hearing a great deal about co-operation in all kinds of business, and particularly so in regard to agriculture; so much so that the American commission, consisting of delegates from all over the country, was sent to Europe this past summer to make a study of agricultural co-operation and rural credits, and many of their findings are exceedingly interesting.

Apparently there are many ways in which our farmers might co-operate to their mutual advantage, but there appears to be a spirit of independence among us which is detrimental to that get-together spirit so absolutely necessary in a co-operative society, and it is difficult to find among us the common point where we can come together.

European experience has proved in case after case that co-operation has brought the farmer up from a hopeless condition to one of prosperity. It seems necessary to have a very bad condition of affairs before co-operation can be brought about. We have seen in this country the western fruit growers organize and co-operate only after they had found it impossible to sell their products as individuals. Undoubtedly some such condition will have to exist here before we can accomplish much, especially in regard to selling agencies. It does not seem as difficult to co-operate in a buying agency. Co-operation would certainly aid us much in such questions as central cold-storage plants; milk stations; transportation companies; sales companies; good seed; cow-testing associations, etc.

One of the most important points in co-operation among farmers is the establishing of a standard for their products. No doubt each individual farmer can establish his own standard, but this means little when selling goods in a large way. The Danes could not sell the enormous quantity of butter exported each year were there not a standard established by the co-operative society, to the rules of which each individual member must conform; neither could they get the large uniform prices as individuals.

We should have co-operative societies in our State to handle the principal crops. Butter, eggs, poultry, milk, fruit, etc., should be sold through State co-operative societies, each package or article bearing the stamp of the association and the grade of the products, thus guaranteeing to the consumer the quality of the goods sold.

Extracts from the Trespass Laws.

The demand for the cloth posters containing extracts from the trespass laws has continued about as usual, and it was necessary to have 3,000 printed in the middle of the year. The frequent requests for, and offers to purchase, posters in addition to the maximum number of five allowed by law to be given to any one applicant in a year has made it desirable that the statute under which these are printed and distributed be so amended as to permit the secretary of the Board to sell at not less than the cost thereof as many additional posters as any applicant may require, the money received from such sales to be credited to the appropriation for incidental and contingent expenses, from which the cost of printing is paid.

Good Seed.

The importance of good seed cannot be too highly emphasized, as this is the most essential step in all of our agricultural work. Certain kinds of seed, like corn, squash, tomato, etc., can best be grown by the farmer himself, provided he establishes a good strain and keeps it up by careful selection; but other seeds are difficult to grow, and here we must depend on the seedsmen for our supply. All seed should be tested both as to its germinating per cent. and its freedom from weed seed; and where strains of known worth are carried by seedsmen, we should not hesitate to pay more for them than for seeds of unknown merit. As a rule, seed germinated satisfactorily this season, but in some instances a very poor quality of seed was sent out, resulting in many cases in the entire loss of the crop. The screening, to eliminate that which is too small, is a good practice, and shows remarkable results, particularly in the tobacco industry. The sizing of lettuce seed for the greenhouses is also a marked advantage, resulting in perfectly uniform beds of lettuce.

Poultry Premium Bounty.

The poultry premium bounty was distributed to the different poultry associations applying therefor, in proportion to the premiums paid for the breeds specified by the Board. Two societies each received the maximum allowance of $300. The following list shows what societies received bounty and the amount to each: —

Attleborough Poultry Association,	$70 55
Dalton Poultry, Pigeon and Pet Stock Association,	160 43
Eastern Massachusetts Poultry and Pigeon Association,	111 03
Holyoke Poultry and Pet Stock Association,	300 00
Lenox Poultry Association,	147 71
Mansfield Poultry, Pigeon and Pet Stock Association,	56 18
Milford Poultry Association,	260 40
New England Poultry Association,	202 90
Northern Berkshire Poultry Association,	115 33
Springfield Poultry Club,	300 00
Total,	$1,724 53

Booklet on Massachusetts Agriculture.

This office is receiving an average of six applications daily for information regarding agricultural land and opportunities in Massachusetts, and we sadly need a booklet of some sort to send to such inquirers. This pamphlet should be a good writeup of Massachusetts from an agricultural standpoint. It should be well illustrated and have a number of maps as a supplement and a list of farms for sale, without any lengthy description. I make this latter suggestion after giving the subject due thought, for I have hesitated a long time before advocating anything that would seem at all like a real estate scheme. Many of the people who write or come to this office in search of a farm ask if we have any prices on farm lands, saying that they will not go to see such places unless the prices are fixed before they go, giving as an explanation that when they go to places that are not priced the owners always ask an unreasonable price, especially if the purchaser is a city person.

We are asking this season for $2,500 to publish a booklet on Massachusetts and her agricultural resources, and it is to be hoped that we shall get it, for the advertising which we got from our farm catalogue was certainly many times worth the price.

PUBLICATIONS.

The following publications were issued by this Board during 1913, and may be secured upon application to this office: —

	Pages.	Number.
Agriculture of Massachusetts, 1912,	703[1]	15,000
Crop Report No. 1,	96	8,000
Crop Report No. 2,	88	6,000
Crop Report No. 3,	76	5,200
Crop Report No. 4,	36	5,600
Crop Report No. 5,	48	6,000
List of available publications,	4	2,000
Circular No. 1,	8	10,000
Circular No. 2,	24	5,000
Circular No. 3,	12	1,000
Circular No. 5,	12	2,000
Circular No. 6,	12	3,000
Circular No. 7,	8	1,000
Circular No. 8,		
Circular No. 10,		
Circular No. 11,		
Separate No. 2,	16	1,000
Separate No. 3,	16	500
Separate, Growing Small Fruits and Berries,	24	500
Separate, Some Practical Points in the Management of Poultry for Egg Production.	36	4,000
Separate, Recent Advancement in Market Gardening,	20	600
Nature Leaflet No. 1 (reprint),	4	1,500
Nature Leaflet No. 2 (reprint),	4	2,500
Nature Leaflet No. 5 (reprint),	4	2,000
Nature Leaflet No. 14 (reprint),	8	1,500
Nature Leaflet No. 26 (reprint),	4	2,000
Nature Leaflet No. 27 (reprint),	4	2,000
Nature Leaflet No. 28 (reprint),	8	1,500
Nature Leaflet No. 35 (reprint),	12	1,500
Nature Leaflet No. 38 (reprint),	12	3,000
Nature Leaflet No. 41 (reprint),	4	2,000
Nature Leaflet No. 43 (reprint),	4	2,000
Annual Report of State Inspector of Apiaries (Apiary Inspection Bulletin No. 6).	12	2,000
Annual Report of State Nursery Inspector,	16	400
Annual Report of State Ornithologist,	36	3,000
Directory of Agricultural Organizations,	28	50
Special Report by State Ornithologist on "Useful Birds and their Protection."	451	3,000

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[1] Including twenty-fifth report of the Massachusetts Agricultural Experiment Station 240 pages. Does not include 41 pages of cuts.

BULLETINS ON MASSACHUSETTS AGRICULTURE.

No bulletins have been published this year, although much time has been spent in the revision of Nos. 2 and 3, and the publication of a new bulletin, No. 6, on "Dairying." Every article which appeared in Bulletin No. 2, on "Apple Growing," has been revised by its author, and one or more new articles have been added, making it still more useful to the farmer. This bulletin is now in press, and is expected within a month. Bulletin No. 3, on "Grasses and Forage Crops," has been revised, and an essay on new grasses will be added.

The bulletin on "Dairying," which is now in press, is one which has been needed for some time. It contains articles by some of the leading dairymen of the country, and covers the field fairly well. The bulletin has about 140 pages, including an extensive bibliography. A fairly wide scope is covered by the bulletins now published, which are of great help to the farmer. Bulletins should also be issued on animal husbandry and beekeeping. The supply of Bulletins Nos. 1 and 5, on "Poultry Culture" and "Vegetable Growing," respectively, is getting low, and they will need to be reprinted the coming year.

CROP REPORTS.

The monthly Crop Reports were published this year as usual, with the exception of the October issue, the issuance of which has been postponed owing to lack of money. A number of interesting and helpful special articles were contained in the various numbers, including "Peach Growing in Western Massachusetts," by Mr. L. W. Rice, "Co-operation," by Mr. C. R. White, "Diversified Farm Accounting," by Mr. L. A. Sloman and "Farm Ice Houses," by Mr. B. S. Pickett.

The May issue was the quarter century number of the Crop Report, and contained the names and a sketch of all active correspondents, together with their terms of service. The editions were as follows: May, 8,000; June, 6,000; July, 5,200; August, 5,600; September, 6,000. Copies of the June, August and September issues are still available at this office.

After carefully considering the question of Crop Reports, your secretary has come to believe that it would be wise to discontinue the printing of these. The ground regarding the crops is fairly well covered at the present time by the papers and the United States government, and while these agencies may not get at the same source of information as do our correspondents, the reports are quite complete. As at present conducted we have no paid correspondents, and it is becoming increasingly difficult to get correct data from our correspondents, and, further, to get it printed quickly enough to be of value. In many ways it is to be regretted that work of this sort should be given up, but unless we can get more accurate data, and get them more quickly, it would be better to use the money in some other way. To this end I would suggest a weekly letter, containing market quotations on the principal crops, together with some topics of vital interest to our farmers.

Publication of Annual Report.

The Board voted at Springfield to accept the recommendation of the secretary regarding the publication of the annual report, which in brief is as follows: —

That there shall be printed for distribution 5,000 copies of the report as it is at present, but without the experiment station report, and that there shall be printed separate copies of all papers and lectures for general distribution, in such numbers as may be deemed necessary by the secretary. The reason for this recommendation is that very often persons coming to the office wish only one bulletin and now have to take away the whole volume. There would also be considerable money saved in mailing and in printing, and the following table will show the approximate saving, both in pages and money cost. The present cost of printing the annual report is $6,000 and the estimated cost of the new book would be $3,250, thus leaving a balance of $2,750 to be used in printing separates from the reports for wider distribution.

Legislative Appropriations.

Objects for which appropriated.	1913.	
	Appropriation.	Used.
Traveling and necessary expenses of the Board,	$1,300 00	$1,458 34
Salaries of secretary and clerks,	5,700 00	5,700 00
Traveling and necessary expenses of the secretary,	500 00	329 19
Lectures before the Board and extra clerical assistance,	1,600 00	1,595 21
Incidental,	1,600 00	1,593 60
Dissemination of useful information in agriculture,	6,000 00	6,001 48
Printing 15,000 copies "Agriculture of Massachusetts,"	6,000 00	-
Bounties to agricultural societies,	32,000 00	27,207 18
Poultry premium bounties,	2,000 00	1,724 53
Encouragement of orcharding,	500 00	501 39
State apiary inspection,	2,000 00	2,000 00
State nursery inspection,	15,000 00	15,074 64
State Ornithologist, salary and expenses,	2,000 00	1,927 81
Special exhibitions,	2,000 00	2,018 53
Premiums to children,	1,000 00	995 74
Encouragement of dairying,	5,000 00	3,834 81
Reclaiming wet lands,[1]	15,000 00	13 75
Dairy Bureau, salaries and expenses,	10,300 00	10,300 00
	$109,500 00	$82,276 20

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[1] Jointly with State Board of Health.

CONCLUSION.

In closing this report I wish to call attention to several rather important things in connection with the future of the Board. In the first place, I want it distinctly understood that the Board is not the secretary, but that responsibility rests upon each member for the work of the Board. We are a large body, but organized as we are, I firmly believe that no other form of organization can in any way keep in as close touch with the farmers as can ours; but it remains with you to keep this office informed regarding the needs of the farmers in your district, for in no other way can we keep in touch with you. This office wishes to serve all the farmers all the time. We want your close co-operation and suggestions as to your needs. Several methods suggest themselves to me as means by which this office could be of service to you, one of which would be to supply the delegates with a list of reliable commission men in each city so that these lists would be available to the farmers of the district; another way would be to supply lists of reliable nurserymen, seedsmen, etc., and the prevailing prices of fertilizers which the farmers should pay, as well as freight rates.

The crop distribution problem is a large one in the State. Let this office know just what particular needs your section has in relation to this. Send us clippings from local papers regarding agriculture, and, what is more important, keep the local papers informed as to the doings of the Board. The information you receive at meetings of the Board should be passed along to the farmers in the district, and if you cannot do this, ask the farmers to write to the office for such information as we can give to them. It will be the aim of this office to keep in as close touch as possible with the farmers of the State, but we need your help in doing it.

As delegates to this Board you must not feel that you have done your duty in holding your fair, but remember that you are the representative of the farmers for your district, and try to do all that you can in assisting the farmers about you to raise better crops and to market them in the best way.

SUMMARY OF RECOMMENDATIONS OF THE STATE BOARD OF AGRICULTURE.

1. That the annual salary of the general agent of the Dairy Bureau be increased from $1,800 to $2,300.

2. That the method of publishing the annual report be changed so as to provide for a more economical expenditure of the appropriation of $6,000 for this purpose.

3. That a special appropriation of $2,500 be made for collecting and distributing all available facts relating to the agricultural resources, advantages and opportunities of the Commonwealth.

4. To provide for an appropriation of $500 for the purchase and preservation of agricultural books, photographs, exhibits, specimens and the like for the library of the Board.

5. To change the month from October to August in which bounty to the agricultural societies shall be paid, and to increase the distance which the grounds and buildings of new societies must be from those of established societies. (Two bills.)

6. To provide for an increase from $1,000 to $3,000 in the appropriation for premiums to children and youths.

7. To provide for restricting the "poultry premium bounty," so called, to premiums offered and paid through poultry associations, as by the State Board of Agriculture, and to further provide for certain perfecting amendments to the law authorizing the payment of said "poultry premium bounty."

8. To provide for a division of the appropriation for lectures before the Board and extra clerical assistance, so as to permit the payment for said lectures from the appropriation for disseminating useful information in agriculture, and so as further to permit the payment of all clerical assistance in the office of the Board, with the exception of the first clerk, from an appropriation of $5,000 for this purpose alone.

9. To authorize the sale of posters containing extracts from the trespass laws.

10. To provide for an increase in the annual salary of the State Ornithologist from $1,500 to $2,000.

11. To provide for the repurchase by the owners of wet lands, deeded by gift or sale to the Commonwealth, for the purposes of reclamation.

12. To provide for an increase from $2,000 to $3,000 in the appropriation for the encouragement of agriculture by the holding of special exhibitions.

13. To further extend and protect co-operative associations.

14. To facilitate rural credits and enlarge the powers of credit unions.

Respectfully submitted,

WILFRID WHEELER,
Secretary.

SUMMARY OF CROP CONDITIONS, 1913.

The season opened warm, with seasonable rains, and the usual amount of planting seems to have been done up to about the 10th of May. Frosts on this date occurred in several sections. After a short, dry, cold spell rains and warmer weather arrived to help vegetation. Pastures and mowings showed good growth early in the season, but received a setback in May. Fall seeding wintered well in most cases, although there were scattering reports to the contrary. All fruits except plums bloomed well. Small fruits showed the best bloom for the State. Frosts injured all fruits in some sections, more noticeably in the valleys, and damage of greater or lesser degree was reported from all parts except Dukes and Nantucket, which did not furnish information on this question. Strawberries were most affected by frost. The season of 1912 and the mild winter following seem to have been peculiarly favorable to the multiplication and preservation of the tent caterpillar, while the warm spring insured early incubation and an abundance of food. Cutworms, brown-tail and gypsy moths, currant worms, elm-leaf beetles, June bug larvæ, codling moths and bud moths were the most injurious insects of the month. The amount of planting done during the month was below the average. Farm help was reported to be scarce and the percentage of good help small. Wages showed no advance over those of the previous year. Many new orchards were set out and old ones were reported as being better taken care of. Successful experimentation with alfalfa was reported from various parts of the State. Hawks, crows, blackbirds and pheasants were named as being the most injurious birds to crops and chickens.

The weather of June was of the average midsummer type, with the temperature about normal, and rainfall irregularly distributed and, generally speaking, below the average for June. In some sections there was a scarcity of rain, and droughty conditions prevailed during half of the month, while in others heavy rains attending local storms gave precipitation near or above the seasonal average. Conditions were very favorable for planting, for growing crops and cultivation. At the close of the month it was generally considered that the season was behind the average. Twenty-five different kinds of insects were reported as doing damage. The damage done by the tent caterpillar in May showed more plainly, while the potato beetle, brown-tail and gypsy moths, squash bugs, striped cucumber beetles, cabbage worms, cranberry fireworms and others were plentiful. Indian corn was reported as from one to two weeks late, owing to cool, dry weather, which not only restrained farmers from planting but retarded germination. Grasslands did not get enough rain in June to offset, in spite of the warm sunshine, the effects of the cool, cloudy weather of May. The early potato crop was said to be just showing above the ground in a good many places. The vines were growing well, however. The yield of early market-garden crops was below normal, but prices ruled high. The supply of dairy cows had shown a decrease of 6.8 per cent. over that of one year ago. Milk, cream and butter production had not decreased in proportion to the cow supply decline. Cream production had, in fact, increased in a few counties. Wholesale milk prices were reported as ranging from 20 to 51 cents per can of 8½ quarts. Retail prices for milk had shown an advance of 1 to 2 cents per quart in a number of places within the past year. Pastures were in much better condition than for the last three or four years, but still far from normal. Rain was badly needed for such upland pastures as are not supplied with springs. The berry crop prospect exceeded that for tree fruits. Blackberries in particular offered promise of a full crop. The apple outlook was discouraging, owing to tent caterpillar and frost damage. Frosts occurred June 7 to 10 in all counties excepting Essex, Norfolk, Dukes and Nantucket, temperatures ranging from 22° F. to 38° F. Grass, corn and nearly all vegetables were damaged in Berkshire and Franklin counties. Strawberries, beans, tomatoes and vines suffered.

July was warmer than usual, with precipitation from 40 to 50 per cent below normal. The mean temperature of the month ranged from 2° F. to 3° F. above the July normal. The droughty conditions of June continued through July, but with less intensity. The prevalence of fair weather, with an abundance of sunshine, was very favorable for harvesting and housing grain and grasses. The most prevalent insect of the month was the Colorado beetle, while the elm-leaf beetle, squash bug, gypsy moth, cutworm, tent caterpillar, brown-tail moth and others were reported as doing damage in various parts of the State. The condition of corn had dropped off 3.6 points since June 27, owing to the drought and to poor germination of late-planted fields. It seemed evident that, especially on sandy soils, the crop would come to maturity before reaching its full growth. The bulk of the hay crop had been harvested in excellent condition, owing to the lack of showers. The potato crop prospect was far from encouraging, since drought had hindered the even sprouting of the tubers and general development. Market-garden crops were much below normal in condition, and root crops were growing slowly. Prices were normal or higher in all counties save Bristol and Plymouth. Considerable apprehension was felt that the continuance of the drought would seriously affect still further fruits not harvested. Apples offered the poorest prospect. Pasturage condition had slumped 18.2 points during the previous month, although its condition was probably better than for the past three years, because of the fine start early in the spring. Forage crops and small grains were much below normal. In 61 towns an estimated total of 733 acres of apple orchards had been set in 1912 and 1913.

August was slightly warmer and much drier than the average. The rainfall of the month was from 30 to 40 per cent below normal. Rain fell on an average of nine days. The month as a whole was unusually pleasant. At the close there was much need in all sections of a general rain. Many fields of corn, particularly on the lighter soils, showed the effects of the drought in shorter stalks and smaller ears. Furthermore, the ears were not tipping well and the kernels were not filling out normally. Grass on water-retentive soils in a state of high fertility was reported as producing a fair second crop, but it looked as though rowen, in general, would fall far below normal. The drought prevailing in most sections throughout the month, while most unfavorable to the growth of blight and rot, did not allow normal development of potatoes. The crop prospect estimate for apples, peaches, quinces and grapes continued to decline, while that for pears and plums had increased several points each since July 26. Pastures in most sections had practically ceased to furnish feed for stock, and feeding at the barn was reported by several correspondents. Late celery was planted in a dry soil, and, except where irrigated, had a dry soil in which to grow. Drought cut all garden truck and made germination of late-sown crops difficult. The tobacco acreage was reported as larger than usual. The acreage of shade-grown tobacco, however, had decreased on account of the light demand for last year's crop. Harvesting had commenced at the time of making returns, but only a small percentage was being primed.

The weather of September was near the seasonal average, the temperature and rainfall departing but little from September normals. There was a rainy spell with moderate rainfall from the 18th to the 22d, inclusive, but during the rest of the month the precipitation was the result of local showers. The month as a whole was slightly cooler. The monthly temperatures over the State ranged from ½° F. to 1° F. below the normal. There was the average amount of sunshine. The corn crop was much benefited by rains occurring late in August and early in September, and, in spite of heavy frost, the yield estimate of the entire crop showed an advance of a point over the condition estimate of August 25. Grass responded more than any other crop to September rains, but the injury done the roots by the recent and preceding summers' droughts was too great to admit of any great progress of the rowen crop to a normal. Pastures were helped by the rains more than was rowen. The weather was favorable to the germination of fall-sown forage crops. The onion crop was reported as far below that of last year, which was normal or slightly above. Thrips had greatly injured the crop and drought had reduced the size of the onions. The quality was such as to insure a well-cured product. The crop of late potatoes was slightly larger than anticipated on August 25, but much smaller than that of 1912. The quality was excellent with remarkable freedom from rot. Among late market-garden crops, beets, parsnips and carrots offered the best prospects. Pears were the largest fruit crop harvested during the month. Grass, cabbage, turnips, corn, fall feed and potatoes were most benefited by rain. Frosts occurred between the 9th and 16th, inclusive, throughout the five western counties. Locally, frosts occurred from the 1st to the 18th, with one in Hampshire on the 23d. Those on the 14th, 15th and 16th were severe and widespread, being reported from every county. For the State, the greatest damage, in order given, was done to corn, tomatoes, squash, beans, potatoes, millet and melons. Tobacco was reported as being 79 per cent of a normal crop, and prices offered were .7 per cent above normal.

The general opinion of correspondents was that prices were slightly higher than in 1912. Plymouth was the only county to show a decrease in prices over the previous year, and here the price level was reported as only 1½ per cent off. Taking the State as a whole, general agricultural prices advanced a trifle less than 5 per cent.

PUBLIC WINTER MEETING

OF THE

BOARD OF AGRICULTURE

AT

SPRINGFIELD.

DECEMBER 2, 3 AND 4, 1913.

PUBLIC WINTER MEETING OF THE BOARD, AT SPRINGFIELD.

The annual public winter meeting of the Board for lectures and discussions, was held at the municipal building, Springfield, on Tuesday, Wednesday and Thursday, Dec. 2, 3 and 4, 1913. The co-operation of four other agricultural organizations, the Hampden County Improvement League, the Massachusetts Dairymen's Association, the Massachusetts Milk Inspectors' Association and the New England Alfalfa Growers' Association, helped to make the meeting an unusually successful one, both in point of numbers and enthusiasm.

The meeting was called to order at 10.25 A.M. by Wilfrid Wheeler, Esq., secretary of the Board. Secretary Wheeler introduced Hon. John A. Denison, mayor of Springfield, who delivered the address of welcome.

ADDRESS OF WELCOME, BY HON. JOHN A. DENISON, MAYOR OF SPRINGFIELD.

I want you to believe that we are glad to have you here. Springfield feels the compliment of your coming to this city, and Springfield wants to do for you everything that she can to make this meeting an entire success and a very pleasant occasion for all of you. We are glad to have you here for more reasons than one. Springfield had two problems: one of them is transportation and the other one is food. Transportation is on the way to a solution, I think; our bridge problem and our railway problem are being solved satisfactorily, but the food problem is a long way from being solved, and its solution means much to the success or the failure of this city. We are growing here, gentlemen; we have got a future ahead of us, but if we are going to come in to the entire fulfillment of our destiny, we need you, we need the State Board of Agriculture, we need that most excellent college at Amherst, and we need such organizations as the Hampden County Improvement League, which is doing a wonderful work.

Springfield is located in a valley, and in whichever way you may look, to the west or to the east, your eyes rise. I think our destiny lies in the hills, "whence cometh our help." You are very welcome.

Secretary Wheeler. In the absence of Mr. Bursley I have asked Mr. Abner Towne of Williamstown to respond to the mayor's welcome.

RESPONSE FOR THE BOARD, BY MR. TOWNE.

Ladies and Gentlemen: I see there are not very many ladies, but there are enough to hold the balance of power. I don't know why they should put it on to me in this case, a buckwheat farmer from Berkshire County, to come here and speak to these men of experience, but I am going to do the best I can.

In answer to Mayor Denison I want to tell him that he does not have to worry a great deal about the food supply of this place. Although I have never been in Springfield before, I have known something of Springfield through the "New England Homestead," and otherwise. These farms, gentlemen, that have been neglected on the hillsides are going to be better tilled; that is one thing that will bring more food to Springfield. Also, there is a spirit of co-operation through all the country now that is bringing the people closer together. They are going to work hand in hand, and where one lags another is going to help out; and so I think you needn't worry a great deal about the food supply.

As to the matter of transportation, well, there will always be a lot of fellows, you know, who want to get their hands into the pockets of the public and get all they can for transporting people and merchandise and food products. The milkmen, too, may get a monopoly of the milk business; but I think we will work those things all out.

I am glad to be here with you, gentlemen. It is a beautiful day for a meeting, and I am glad to see here so many people, and especially the members of the State Board of Agriculture. I trust that we shall be better acquainted with each other when we get through, and that our deliberations will tend to make for us a better country and better homes, and to make us better Christian men and women.

Secretary Wheeler here read an invitation from the Springfield Board of Trade to a reception on December 3, and then called upon Mr. P. M. Harwood of the Dairy Bureau for an announcement of the prizes awarded in the clean milk contest in the western part of the State.

ANNOUNCEMENT OF DAIRY PRIZES.

MR. P. M. HARWOOD, GENERAL AGENT, DAIRY BUREAU, STATE BOARD OF AGRICULTURE.

Two or three years ago the former secretary of the Board of Agriculture made a suggestion that something be done in the way of encouraging the dairy farmer, and after two or three years of effort a bill was passed by the Legislature which empowered the Board of Agriculture to expend a sum not exceeding $5,000 per year for three years, for the encouragement of dairying. Now, any one who knows anything about the dairy business knows that it is a very intricate business; that there are many ramifications; and that it is practically impossible to entirely perfect the dairy business or to do any one thing that will bring about a millennium in the production of clean milk.

The Legislature was asked for $25,000, and only $5,000 was appropriated, and with that meager sum, — for it is a very meager sum when you come to distribute it among so many milk producers, — with that meager sum you can expect to do but a few things at a time. Now, don't expect too much. What the Dairy Bureau of the Board of Agriculture has done in this matter is simply this: a step has been taken whereby it is hoped to awaken a real interest, a real enthusiasm, in the production of clean milk and in the keeping of flies away from milk products. To that end prizes have been offered. For convenience the State was divided into two sections. The eastern section consists of the territory lying east of the line between Middlesex and Worcester counties, and that west of this line is called the western section.

In September the contest was on in the eastern section, and the first prize was won by Mr. E. B. Hutchins of Stoughton, a man of modest means, who had lost his barn by fire and had to use a shed to milk in. Last March this man won as first prize for clean milk at Amherst a bull calf, which in turn won a first prize at the recent Brockton Fair, and the same man won first prize for clean milk at Brockton, under the bacteria test, — a first prize of $100. He is a man who is dependent upon his labor, upon his farm, for a living.

Now, when this bill was before the Legislature the committee said, "There is no use in offering these prizes. The fancy farmers will get them all." I said, "You never made a greater mistake than that in your lives, gentlemen. We will have this thing fixed so that such people can't enter, but," I said, "if they do, you needn't worry. Clean milk is not necessarily milk produced in a $40,000 or $50,000 barn." Now, the winner of the first prize in the eastern section proved that.

In the western section the first prize goes to Peter Kronvall, of East Longmeadow, a Swede who is earning his living and is also a comparatively poor man. I want to tell you something about this Swedish farmer who has come here and is earning his living among you. He has a wife, as I suppose most of the contestants have. The wife's share is a notable thing about all these contests; as, for instance, when Mr. J. F. Adams won first prize for the best farming operations in Massachusetts, his wife was right there at his shoulder, helping him out. Mr. Adams did his part and Mrs. Adams did hers, and together they took a $400 prize. Peter Kronvall's wife did the milking, and she milked in an open-top pail. I don't recommend the open-top pail for the use of any man; but a woman, on account of the way she sits and holds the pail for milking, can't use anything but an open-top pail. A woman's method, as you have no doubt noticed, is to hold the pail out from under the cow.

The entire list of prize winners is as follows: —

List of Prizes.

The following premiums were awarded for the best samples of hand-drawn, unstrained mixed milk of five cows. There were 114 contestants: —

First prize, $100, Peter Kronvall, East Longmeadow.
Second prize, $95, Joseph S. Hillman, Hardwick.
Third prize, $90, Rufus H. Randall, Bolton.
Fourth prize, $85, Willard M. Cooper, Agawam.
Fifth prize, $80, Clarence B. Brown, Brimfield.
Sixth prize, $75, Sylvester Spellman, East Longmeadow.
Seventh prize, $70, William H. Morey, Cummington.
Eighth prize, $65, Miss M. Anna Cleveland, Hardwick.
Ninth prize, $60, Oscar C. Pomeroy, Longmeadow.
Tenth prize, $55, Marchant M. Martin, Southborough.
Eleventh prize, $50, Joseph C. White, West Springfield.
Twelfth prize, $45, Charles J. Nelson, Agawam.
Thirteenth prize, $40, Hermon W. King, East Longmeadow.
Fourteenth prize, $35, F. J. Pomeroy & Son, Agawam.
Fifteenth prize, $30, Dana S. Moore, West Springfield.
Sixteenth prize, $25, John B. Walker, Orange.
Seventeenth prize, $20, James Lawton, East Longmeadow.
Eighteenth prize, $15, Leander W. Newton, Southborough.
Nineteenth prize, $10, Harry S. Ashley, East Longmeadow.
Twentieth prize, $5, William Reimers, Monson.

I want to speak of the second prize winner in the eastern section. Mr. Webb has his milking done in an 8½-quart can. He told our agent that he calls any man a fool that would use a milk pail at all. He says a man can learn in three days to milk into an 8½-quart can. It took him about three days to learn it, and our agent reports that he did it very handily. The next day after this prize was announced in the papers in Needham, or within a few days, anyway, Mr. Webb, who won the second prize, received 50 more applications for milk than he could fill. He had been selling milk at 9 cents a quart, and he has now put the price up to 10. Doesn't that kind of thing help a man? He says he doesn't care about the money value of the prize; that is only incidental, to what he is going to get out of his dairy because he won the prize.

I want to add also in regard to Peter Kronvall that he did absolutely nothing, — of course they can't all say this, — but he did absolutely nothing but what he does every day, except that in this instance the wife did the milking, which is done usually by herself and son.

It should be said in relation to Miss Holmes, one of the winners, that she is a woman of unusual ability; she has taken a correspondence course at the Agricultural College, and she has advanced very rapidly in agricultural knowledge and evinced more intelligence and good judgment and care in the protection of her premises from flies than any other person who entered the contest.

I would be very glad to go on further if I had time, but I judge from the hint given me by your secretary that I must say no more at present. Perhaps later an opportunity will be given me to read a paper on this fly contest, which I shall be very glad to do, because I think it is a matter which ought to be thoroughly understood.

However, if you will pardon me, Mr. Secretary, there is just one more thing I want to say and that is that if a person didn't win a prize in this contest he must not be discouraged. Be game. The reason you didn't win a prize was not because you produced dirty milk, but only because some one else did just a little better. When this thing comes up again, come back, every one of you. Come back determined to be the prize winner. The chances are almost 100 to 1 that some of you who lost this time will be prize winners next year.

Secretary Wheeler. It is a difficult thing to realize what has been done in the State of Massachusetts in regard to the raising of poultry, and to that end we thought it was necessary to have some one speak on the subject at this meeting, and I think we couldn't have secured a better man than Professor Graham of the college to come and tell us something about this important subject. It gives me great pleasure to introduce to you Prof. J. C. Graham, of the Amherst Agricultural College, who will speak on "Feeds and Feeding."

POULTRY FEEDS AND THEIR METHODS OF FEEDING.

BY PROF. J. C. GRAHAM OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

It is impossible to discuss intelligently the subjects of feeds and feeding, from both a practical and scientific point of view, without thoroughly understanding a number of important terms now in quite common use. We can hardly pick up a poultry journal or a book on this subject without coming in contact with such terms as protein, carbohydrates, fats, nutritive ratio, balanced ration, etc. As there may be some present who are not familiar with these terms, they will be defined in order that the discussions which follow may be fully understood.

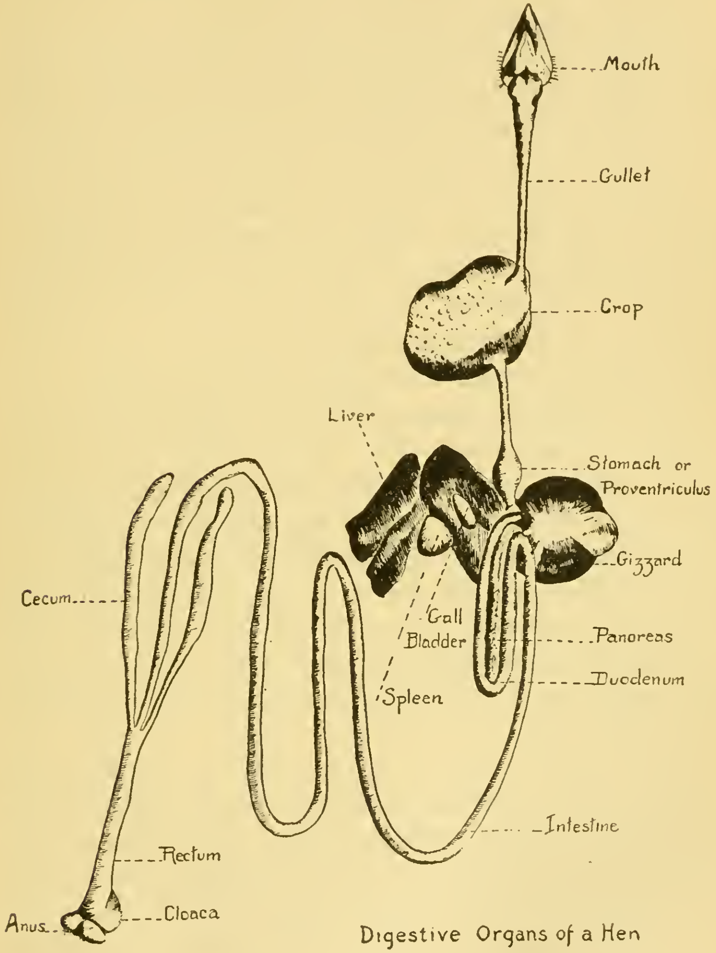
Proteins are made up of the nitrogenous portions of feeds. They are the body builders, used in making the lean meat, eggs, hair, nerves, tendons, etc.

Carbohydrates are the starches and sugars particularly. These are used for energy and heat. A hen may eat a large amount of carbohydrates in twenty-four hours and yet at the end of the time, if she were killed and her flesh analyzed, we would find not more than one per cent of carbohydrates in her body, although her food has been composed largely of these materials. It shows how completely these are changed into other things.

Fats are the oily portions of food; they are also used in the body for heat and energy. The important thing about them is that they are worth for that purpose two and one-fourth times as much as the same weight of carbohydrates. That is, one pound of fats will produce as much heat and energy as two and one-fourth pounds of carbohydrates.

A balanced ration is one in which the amounts of protein, carbohydrates, fats and ash are in such proportions that when it is eaten by the hen there will be no waste of any one of these components.

Food principles, or food compounds, include protein, carbohydrates and fats.


Mouth
Gullet
Crop
Liver
Stomach or Proventriculus
Gizzard
Cecum
Gall Bladder
Pancreas
Duodenum
Spleen
Intestine
Rectum
Anus
Cloaca

Digestive Organs of a Hen

The nutritive ratio is the ratio between the amount of digestible crude protein and the carbohydrates and fats in any given feed. It is found by multiplying the amount of digestible fats by 2¼, adding it to the digestible carbohydrates and dividing the sum by the amount of digestible protein.

We should also have some knowledge of the digestive apparatus of the hen if we wish to thoroughly understand her needs. This plate represents the digestive organs extending from the head to the vent. They were removed from the hen a few weeks ago, placed in the position that we see them here and drawn. This plate does not show the relative position of the organs in the body, but it does represent their relative size. What is known as the gullet extends from the mouth to the crop, which is a reservoir for holding the food until it is softened more or less by the secretions of the mouth and of the crop itself. The crop is not the true stomach of the fowl, as many suppose. The true stomach is an enlargement of what might be termed the continuation of the gullet from the crop to the gizzard. Another term for it is the proventriculus. On opening it we find that its walls are quite thick and muscular, and lined with gastric glands similar to those in the lining of the human stomach. The gizzard is an irregularly shaped organ, the largest in the body, and has thick muscular walls of a very fine grain and of a bluish, dark red color. Partially enfolding the gizzard we find the liver, composed of two very large lobes. Attached to it is the gall bladder, where the bile is stored. Near it also is the spleen, an organ whose use we do not thoroughly understand, although some scientists believe it has some relation to digestion, as it is not found in the same condition just before and after meals.

The pancreas is the long, flat, pinkish organ lying close to the upper end of the intestines, or what is termed the duodenum. This secretes pancreatic juice. The intestines extend from the gizzard to the anus, about six or seven inches from which we find two blind sacks, called the ceca. They are sometimes spoken of as the "blind guts," and correspond to the appendix in man, but are double in the fowl. In diagnosing black head in turkeys, or coccidiosis as it is known in fowls, we find the ceca greatly enlarged, and many times their lining is eaten off, or they may be filled with a hard, cheesy substance. These organs seem to be the habitat for many intestinal worms, and if one is making a diagnosis for coccidiosis, or worms, he would naturally examine the ceca first. The part of the intestines extending from the ceca to the anus is called the rectum. The enlargement of the intestine just forward of the vent is called the cloaca. It is a reservoir where the fæces gather before being expelled from the body. The urinal duct opening into this reservoir is a very important factor in studying the digestibility of feeds in poultry. The fact that the urine and the fæces mix before being expelled makes it very difficult to study the digestion of protein, particularly because in the fæces we find the undigested portions of the feed and in the urine the nitrogenous materials that come from the broken-down cells of the body. As these mix before being expelled, it is very hard to determine how much of the nitrogen comes from the indigestible portions of the feed and how much from the urine. The entire length of the digestive apparatus of the hen is about five feet, varying somewhat in different individuals. Some think that there is a relation between its length and egg production, but more data will be needed to verify this theory.

The process of digestion is somewhat as follows: the food is swallowed by the hen and remains in the crop for a time to be softened. It then passes into the stomach, where it is mixed with gastric juice which acts upon certain portions of the food. From here it passes into the gizzard, where it is ground and thoroughly mixed with the gastric juice already mentioned. It then leaves the gizzard by way of the intestines, where it is mixed with bile from the liver and pancreatic juice from the pancreas. These are very powerful digestive juices, and most of the food is accordingly digested in the duodenum, or the first twelve to eighteen inches of the intestines; but there is also an intestinal juice secreted by the lining of the intestines that acts upon the undigested portions of the food and completes digestion. The digestive apparatus of the goose or the duck differs from that of the hen in that there is no crop. The feed they eat remains in the gullet, which becomes more or less distended, until it passes through the stomach to the gizzard. This difference is probably due to the early habits of the birds. The geese and ducks, being water fowl, were able to eat food almost continually, whereas the original hen found it necessary to store up her food on account of her wandering habits. A thorough understanding of this subject will help us in the consideration of much of the data that will follow.

In our original studies of feeds and food principles, very little attention was paid to the value of the ash, or the mineral portion of feeds. It was thought that if we fed the right proportions of protein, carbohydrates and fats we were meeting all the requirements of the animal. However, more recent investigations and experiences have shown that many times animals do not do well because the food lacks mineral matter. Certain animals have been fed on ash-free food, and it was found that within a few days a decided change took place; the animal became weak, was unable to eat sufficient food, and if the experiment was continued for a few weeks it died.

In studying the needs of various classes of animals, naturally the milk of the mother formed the basis for investigation.

TABLE 1. — *Showing the Importance of Ash, Protein and* P_2O_5 *in the Feed for Growing Stock.*

	Days.	Lime.	P_2O_5	Ash.	Protein.	Sugar.
Woman,	180	.03	.05	.2	1.5	6.8
Mare,	60	.12	.13	.4	1.8	6.8
Cow,	47	.16	.20	.7	3.4	4.7
Ewe,	15	.25	.29	.8	6.7	4.2
Sow.	14	.25	.31	.8	7.2	4.5
Rabbit,	6	.89	.99	2.5	15.5	2.0

The foregoing is a very interesting chart on the analysis of milk of various animals. The first column gives the name of the mother and the second, the number of days after birth required for the young to double its weight. For example, the baby usually doubles its weight in one hundred and eighty days, the colt in sixty days, the calf in forty-seven days, and so on until we reach the rabbit, which doubles its weight in about six days. The third column gives the amount of lime in the milk of the mother. Notice that the amount of lime in the milk of these animals is inversely proportioned to the number of days required by the young to double their weight. The amount of lime in human milk, for instance, is one-thirtieth of that in the rabbit's milk; while the time required for the baby to double its weight is just thirty times greater than that for the rabbit.

Note that there are about equal amounts of lime and phosphoric acid in the milk of each, plenty of this material being provided.

In the next column we note the amount of protein in the milk of these various animals. We find the relative proportions are about the same as that of ash. The last column shows the amount of sugar in the milk. This is in inverse ratio to that of ash and protein, *i.e.,* we find more sugar in human milk and in the mare's milk than we do in that of the rabbit or sow. About the only way we can explain this difference is the fact that the rapid-growing animals, or those that double their weight in a very few days, need a large amount of ash for the framework and also a large amount of protein for building the tissues, whereas the sugar is needed principally for heat and energy, and is not so essential to the growth of the quick-growing animal as the other two, because protein, in case of necessity, can also be used for heat and energy.

As the chick doubles its weight in about twelve days under normal growth, it would come somewhere between the young rabbit and the pig. It therefore needs a large amount of ash and protein in its food.

It may seem to many unnecessary to dwell so long upon a matter of this kind, but there are hundreds of people who give their little chicks nothing but bread and cracked grain, or foods containing no more ash than these. The following chart illustrates the comparative ability of poultry and ruminants to digest some of our common grains: —

TABLE 2.—*Digestibility of Feeds,—Comparison of Hen with Ruminants.*

NAME OF FEED.	PROTEIN.		NITROGEN FREE EXTRACT.		FATS.	
	Hen.	Ruminant.	Hen.	Ruminant.	Hen.	Ruminant.
Bean,	71.7	77	46.0	71	37.0	63
Beef scrap,	92.6	-	-	-	95.0	-
Barley,	77.0	70	85.0	92	67.8	89
Corn,	81.5	76	91.3	93	88.0	86
Oats,	71.3	77	90.0	77	87.8	89
Wheat,	75.0	74	87.0	93	53.0	71

Very little experimental work has been done with poultry on this subject, not because it is not important, but because of the physiological difficulty already mentioned, arising from the fact that the fæces and urine unite in the cloaca before being voided, which makes it very hard, indeed, to use poultry for digestion studies with satisfactory results. However, there are a few men who have attempted work along this line, and we think with considerable success. Among these are Dr. Woods of the Maine station, who obtained the results above shown. He used capons because of their inactive habits, and caught the fæces in a rubber bag attached to them with a sort of harness. His work shows that fowls are able to digest protein almost as well as cows can. Note how well they handle beef scrap and corn, but do only fairly well with oats, barley and wheat, and very poorly with bran.

TABLE 3.—*Digestibility of Feeds,—Comparison of Hen with Ruminants.*

NAME OF FEED.	PROTEIN.		NITROGEN FREE EXTRACT.		FATS.		FIBER.	
	Ruminant.	Hen.	Ruminant.	Hen.	Ruminant.	Hen.	Ruminant.	Hen.
Peas,	83	90.3	94	91.6	55	83.7	64	13.74
Buckwheat,	75	59.4	76	87.0	100	89.2	94	2.02
Wheat,	74	56.9	93	93.3	71	55.2	-	29.95
Barley,	85	79.2	86	89.1	87	68.3	50	-

Here is another table giving data which have been taken from a European experiment. It shows that the hen can digest peas better than ruminants can. If this is reliable, there is no reason why cracked peas and pea meal should not form a part of the ration for fowls. Note also that they cannot digest the protein in our common grains as well as that contained in beef scrap, as shown in the preceding table.

The data given on the digestion of fiber afford very good evidence that the hen cannot digest this material as well as our other farm animals can. It is found, for instance, that the ruminants digest 94 per cent of the fiber in buckwheat, and the hen only about 2 per cent. Also the fiber in peas is hard for her to digest, notwithstanding the fact that she digests the other ingredients in them very well indeed.

TABLE 4. — *Digestibility of Fiber. — Comparison of Hen with Ruminants and Horse.*

NAME OF FEED.	FIBER.		
	Hen.	Ruminant.	Horse.
Rye, ...	2.4	-	31
Oats, ...	.5	31	35
Barley, ...	.2	50	-

This is a chart comparing the digestion of fiber by the hen with that of ruminants and the horse. The data here are very similar to those given in regard to buckwheat and peas. Only about .5 of 1 per cent of the fiber in oats is digested by the hen, whereas from 30 to 35 per cent of it is digested by the horse and ruminants. And barley, another grain similar to oats, being covered with an indigestible husk, is very hard for hens to digest also. Only .2 of 1 per cent of the fiber is digested by the hen, while 50 per cent is digested by ruminants.

It appears from these various studies that, while the hen can handle carbohydrates in our common grains very well, the proteins and fats in them are digested only fairly well; and that while she can digest the protein in our animal products very well indeed, she is unable to digest very much fiber. Therefore, in feeding, we should be careful not to overload our mashes, or rations, with so much of this fiber-laden material that the hen's digestive powers will be overtaxed.

TABLE 5. — *Amount of Droppings voided relative to Time of feeding Wet Mash.*

DATES.	Number of Days' Droppings.	MORNING MASH.		EVENING MASH.	
		Number of Hen Nights.	Weight of Droppings (Pounds).	Number of Hen Nights.	Weight of Droppings (Pounds).
March 3, ...	1	22	3.00	21	6.00
March 5, ...	2	44	5.25	42	11.00
March 7, ...	2	44	5.25	42	10.50
March 10, ...	1	22	2.50	21	6.25
March 21, ...	1	22	2.50	19	4.50

The data of this chart were taken from bulletin 122 of our own station, published a number of years ago but now out of print. This is the result of an experiment carried on by Dr. Brooks, and its object was to determine the difference in weight of droppings voided by hens fed at night on a wet mash and on a whole grain ration. The first column shows the dates; the second, the number of days' droppings gathered; the third, the number of hens on the roost, or, as the chart puts it, the number of hen nights; *i.e.,* on March 5 the droppings were left for two days, so the number of hens were doubled to give the number of hen nights. In the fourth column we find the weight of the droppings. Columns 5 and 6 contain data similar to those of 3 and 4, except that the hens in those pens were fed a wet mash in the evening, whereas the data in columns 3 and 4 are from pens containing hens fed mash in the morning and whole grains at night. It is seen that the weight of the droppings from birds fed wet mash in the morning is only about one-half of that from hens fed wet mash at night. This, it seems to me, is quite conclusive evidence that our ground grains, or mashes, are more quickly digested than the whole grains. This fact has considerable bearing upon the proportion of scratch feeds and mash to be fed to hens we wish to force. A forcing ration should consist of at least half ground grains by weight. If we want to make our ration still more forcing we should cause our hens to eat a still greater proportion of the ground grains.

The following chart shows the value of skim milk as a food, and its data were supplied by an experiment carried on at the Wisconsin Agricultural Experiment Station a few years ago. A sow weighing 23 pounds was placed in a pen in the month of May, where she could get nothing to eat except what was given her. She was fed wholly on skim milk for one year, at the end of which time she weighed about 406 pounds, and produced 10 pigs, the total weight of which at birth was 23 pounds. The sow and pigs were continued on the same ration, and when the latter were six weeks old they averaged 18.6 pounds apiece. We know of no experiment that has ever been carried on that shows more conclusively the value of skim milk as a food. It should be used for poultry when obtainable at 25 to 30 cents per hundred pounds. Better results will follow if it is soured before feeding, as the increased amount of lactic acid aids digestion.

TABLE 6. — *Value of Skim Milk as a Food for Animals.*

	Pounds.
Weight at beginning of experiment,	23.0
Weight one year later,	406.0
Weight of 10 pigs produced,	23.0
Average weight of pigs at six weeks of age,	18.6

CONCENTRATED FEEDS.

Just as concentrates have enabled the dairyman to develop the modern cow, so they have enabled us to develop the hen into the modern egg machine. Were we to feed poultry as it was done forty or fifty years ago, we would not get any more eggs than were produced then. At that time, on many farms, hens were not expected to lay except during the spring and early summer. The reason they laid in the spring so well was because of the green feed, worms, bugs, etc., that they were able to pick up. But concentrates, such as meat meal, gluten feed, oil meal, etc., have enabled us to feed the hen on rich protein foods throughout the year, and consequently we have the 200-egg hen.

In the great corn-growing section of the country the principal grain fed to poultry has naturally been corn, and because the use of corn as the entire ration for hens during the winter months resulted in a low egg production, it came into disrepute as a poultry feed, in spite of its actual good qualities. This caused both the Geneva Station, New York, and our own station to conduct a series of experiments on the value of corn for poultry, with the result of showing that properly used it is a most excellent feed.

TABLE 7. — *Feeding Values of Various Foodstuffs compared with Corn.*

NAME OF FEED.	Heat and Energy (Per Cent).	Value.	Price.
Corn meal,	100	$1 75	$1 75
Oats (ground),	83	1 45	1 85
Wheat,	92	1 61	2 00
Wheat middlings (flour),	98	1 71	1 65
Wheat middlings (standard),	67	1 17	1 55
Wheat bran,	57	99	1 45
Linseed meal,	94	1 64	1 75
Hominy meal,	105	1 82	1 65
Gluten meal,	91	1 59	1 70
Corn silage,	12	21	-

This chart gives data worked out in part by Dr. J. B. Lindsey, of the Massachusetts Agricultural Experiment Station. The second column gives the heat and energy value of the various feeds or grains named in column 1, with corn meal taken as a standard; not, however, including the value of the protein in the grains for body building. Oats, it appears, are worth only 83 per cent and wheat 92 per cent as much as corn in producing heat and energy. Flour middlings as a heat producer almost equals corn, but standard middlings, which sell at only 10 cents per hundred less, are worth only about two-thirds as much as corn meal, yet many times during the year we pay more for standard middlings than for corn meal. Wheat bran, we find, is worth a little more than half as much as corn meal in producing heat and energy, yet we pay a great deal more for it at most seasons of the year. Hominy meal, which can be bought on the market most of the time, is, as a heat and energy producer, worth more than corn meal for feeding. The third column shows the actual value of these various feeds as compared with corn, and the last column shows the price paid for them this fall, about the middle of October. At that time we were paying $1.75 per hundred for corn meal and $1.85 per hundred for ground oats, yet the value of corn meal was 30 cents a hundred more than that of oats. We also paid $2 per hundred for wheat, but its actual feeding value compared with corn, as far as heat and energy are concerned, was 14 cents a hundred less. In the case of wheat middlings we find the value greater than the price paid by about 6 cents. Standard middlings and bran, according to these data, are worth very much less than we pay for them. Linseed meal was worth $1.75 per hundred at that time, and its heat and energy value was $1.64, but this particular feed contains a great deal of protein, the excess value of which, added to the $1.64, would make this a very economical feed.

The feed, giving the best returns for our money, as shown by the table, is hominy meal, which could have been bought at that time for $1.65 per hundred, and its actual feeding value, compared with corn at $1.75, is $1.82. Notwithstanding the high price of corn at the present time, we should use it liberally in our ration, both in the mash and in the scratch feed. We also found in our digestion tables that corn was digested very well indeed by hens. Taking these two things into consideration, it is the very best grain we have for poultry. We should feed sparingly of standard middlings and wheat bran, although we use bran not so much for its food value as to lighten up the ration, and keep the food from packing in the crop.

TABLE 8. — *Rations for Heavy Laying Hens. — Digestible Nutrients needed per Day for Each 100 Pounds Live Weight.*

	Dry Matter (Pounds).	Ash (Pounds).	Protein (Pounds).	Carbohydrates (Pounds).	Fats (Pounds).	Fuel Value (Calories).	Nutritive Ratio.
Hens, 5 to 8 pounds,	3.30	.20	.65	2.25	.20	6,240	1:4.2
Hens, 3 to 5 pounds,	5.50	.30	1.00	3.75	.35	10,300	1:4.6

This is one of the most interesting and valuable tables that has ever been worked out on the subject of poultry feeding. It is well known among experienced and well-informed poultrymen that a balanced ration for hens should have a nutritive ratio of about 1 to 4½. Just how that was worked out may be interesting to many. Dr. H. J. Wheeler, of the Geneva Experiment Station, performed an experiment to determine this along with some other facts, and secured these data.

Note that he worked with birds varying in size. Two pens contained hens weighing from 5 to 8 pounds, and two, hens weighing from 3 to 5 pounds. This table shows the amount of food each lot consumed per day for each 100 pounds of live weight. The experiment ran for a number of months, and what we have here is the average. The ratio between the amount of food consumed per day by the hens weighing from 5 to 8 pounds, as compared with those weighing from 3 to 5 pounds, is about the same for each of the food principles. One interesting fact brought out is that the small hens consumed nearly twice as much per 100 pounds of live weight as the larger hens. This is due undoubtedly to the larger number of eggs laid by the small hens, weight for weight, as there were perhaps 24 or 25 hens in the one pen and 15 or 16 in the other.

Another interesting fact is the ratio between the amount of ash and protein in the food consumed, which is about 1 to 3. This is doubly interesting because there is one particular mash on the market to-day that contains nearly twice as much ash as protein. It seems to me that poultrymen should think twice before they buy a mash that is loaded up so heavily with mineral matter.

But the main point in regard to these data is that the conclusion here reached, that the nutritive ratio of a balanced ration for a hen is about 1 to 4½, forms the basis for compounding our rations at the present time.

On account of many letters received asking information regarding the value of sprouted oats as a poultry food, we concluded to make an analysis of whole oats and of sprouted oats, to see whether there was a loss or gain through sprouting. A sample of whole oats was taken, and another sample from the same lot was sprouted in the usual way. When the sprouts were 1½ inches long a sample was analyzed and compared with the analysis of the original sample. The comparison is shown in this chart.

TABLE 9. — *Analysis of Whole Oats and Sprouted Oats* (*Per Cent*).

NAME OF INGREDIENT.	Whole Oats.	Sprouted Oats.
Protein,	15.05	15.24
Albuminoids,	13.81	12.22
Amides,	1.24	3.02
Fat,	8.80	8.91
Nitrogen free extract,	62.50	60.49
Fiber,	10.36	12.31
Ash,	3.29	3.05
Soluble sugars (dextrose),	1.33	5.78

It can be seen that the sprouting of these oats made very little difference in their nutritive value. There was a slight decrease in the amount of ash and a very perceptible increase in the amount of soluble sugars, *i.e.*, some of the starch in the oats was changed to sugar in the form of dextrose. That sprouted oats are very palatable is a well-known fact among poultrymen, and the changing of some of the starch to sugar no doubt accounts for this. We conclude, therefore, that the sprouting of oats does not decrease their actual nutritive value, and that we gain considerable in palatability and also in having a green food.[1]

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[1] Mr. Philip H. Smith, of the Massachusetts Agricultural Experiment Station, performed the chemical analysis.

There has been upon the market for the last few years a certain grit known as Hen-e-ta, for which great claims have been made by the company putting it out. In one of their circulars a statement was made that the eggs from hens fed Hen-e-ta contain twice as much phosphoric acid as ordinary eggs, and, therefore, hatch better. We decided to feed a lot of hens on oyster shell and another lot on Hen-e-ta, in order to test this claim by analyzing the eggs. Two pens of White Leghorns were selected and fed for about six weeks, one on oyster shell and the other on Hen-e-ta. In other respects their feed was the same. At the end of the period six eggs were selected from each pen and analyzed, with the following results: —

TABLE 10. — *Analysis of Eggs.*

	PER CENT OF PHOSPHORIC ACID (P_2O_5).	
	Oyster-shell Eggs.	Hen-e-ta Eggs.
Egg shells,	.33	.33
Whites of eggs,	.32	.27
Yolks of eggs,	2.77	2.81

It would appear from this analysis that the whites of the eggs from the oyster-shell pen contained slightly more phosphoric acid than those from the Hen-e-ta pen, whereas the yolks of the eggs from the Hen-e-ta pen contained slightly more phosphoric acid than those from the oyster-shell pen. This slight apparent difference evidently lies within the radius of experimental error, so our conclusion naturally is that the feeding of Hen-e-ta rather than oyster shell makes no difference in the amount of phosphoric acid in the eggs.[1]

It would be much more convenient for the average poultryman were we to compound our rations on the basis of measure rather than of weight, because many poultry keepers either do not buy a large quantity of feed at a time, or, even though they do, they may not mix it all at the same time;

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[1] Mr. H. D. Haskins, of the Massachusetts Agricultural Experiment Station, performed the chemical analysis.

many of them have no scales suitable for weighing grain, and are, therefore, obliged to measure out the different ingredients, and guess at the amounts corresponding to the weights desired. Especially is this true of the smaller poultry keepers. The reasons, however, why we base the amounts upon weight rather than measure in compounding rations are that all feeds, as a rule, are bought by weight, and also that measuring cannot be done accurately enough for scientific work. The following table is intended to aid those who find it convenient to compound their feeds by measure: —

TABLE 11. — *Equivalents of Weights and Measures.*

NAME OF FEED.	Quart.	Pound.	Pound.	Quart.
Alfalfa meal,	1	1.0	1	1.0
Corn, whole,	1	1.7	1	.6
Corn meal,	1	1.5	1	.7
Gluten feed,	1	1.3	1	.8
Linseed meal,	1	1.1	1	.9
Oats, whole,	1	1.0	1	1.0
Oats, ground,	1	.7	1	1.4
Wheat,	1	1.9	1	.5
Wheat bran,	1	.5	1	2.0
Wheat middlings,	1	1.2	1	.8

This chart, showing the equivalents of weights and measures of our most common poultry feeds, was prepared by Dr. Lindsey, with the exception of a very few items. The second column, giving the equivalents of 1 pound in terms of quarts, is the column that is of especial interest to the poultrymen who wish to do their mixing by measure. It, of course, makes no difference whether you use a quart measure, a peck measure, a bushel measure or a box, providing you use the same in measuring all of the ingredients. The table shows that if you wish, for example, to make a mixture containing equal parts by weight of corn meal, gluten feed, ground oats, wheat bran and wheat middlings, you will take about ¾ quart of corn meal, ¾ quart or a little more of gluten feed, nearly 1½ quarts of ground oats, 2 quarts of wheat bran and ¾ quart or a little more of wheat middlings, in order to get the proper proportions by weight. In the same way one can make various mixtures by using the proper measure for each, and yet have the result based on weights.

Table 12.—*Chemical Components of Poultry, Eggs and Corn (Per Cent).*

	Water.	Ash.	Protein.	Fat.	Carbohydrates.
Composition of the hen, . .	55.8	3.8	21.6	17.0	-
Composition of the egg, . .	65.7	12.2	11.4	8.9	-
A very fat fowl, ...	41.6	3.7	19.4	33.9	-
Composition of corn, . . .	10.6	1.5	10.3	5.0	66.0

This chart shows the composition of an average hen, of the egg, of a very fat fowl and of corn. We see that corn fed alone — and the same is true of most of our other grains, generally speaking — is far from giving a balanced ration, but is a very one-sided feed. The hen, for instance, contains 3.8 per cent ash and the egg 12.2 per cent, whereas corn contains only 1.5 per cent ash. Again, the hen contains 21 per cent protein and the egg 11.4 per cent; the fat fowl 19.4 per cent and corn only 10.3 per cent.

The same is true of fats, as is seen when we compare the carbohydrates in corn with the fat in the hen and the egg.

The ratio of protein to carbohydrates in corn is about 1 to 9 in round numbers, so that if the hen which, under good laying condition, uses 4½ pounds of carbohydrates and fats to every pound of protein, is fed corn alone, she will be obliged to eat 9 pounds of carbohydrates and fats, or twice the amount she ought to consume in order to get a pound of protein. On the other hand, if we feed her too much protein in proportion to carbohydrates and fats she will be obliged to eat more protein than necessary. Whenever the hen must eat more of any one of the food principles than she really needs there not only is a waste of feed, but an extra strain is brought upon the digestive system to handle this excessive amount of food. We should see to it, therefore, that our hens have as nearly a balanced ration as possible, if we wish to be economical and keep the hen in the best condition.

A mixture of equal parts by weight of corn, wheat and oats has a nutritive ratio of about 1 to 8½. In order, therefore, to provide a balanced ration, we must feed something in addition to these grains that has a much larger percentage of protein. We have, therefore, adopted what we term the mash, a mixture of ground grains and by-products. By feeding such a mash, with a nutritive ratio of 1 to 2.3 to 1 to 3.6, together with about an equal amount of scratch feed, we place before the hen materials from which she can balance her own ration.

TABLE 13. — *Poultry Mashes.*

Mash 1.	Mash 2.	Mash 3.
200 pounds wheat bran. 100 pounds wheat middlings. 100 pounds corn meal. 100 pounds alfalfa (ground). 50 pounds beef scrap. 50 pounds linseed meal. 50 pounds gluten meal.	100 pounds wheat bran. 100 pounds wheat middlings. 100 pounds corn meal. 100 pounds fine ground oats. 100 pounds alfalfa (ground). 100 pounds beef scrap.	100 pounds wheat bran. 100 pounds wheat middlings. 100 pounds corn meal. 100 pounds ground oats. 100 pounds gluten feed. 100 pounds linseed meal. 100 pounds beef scrap.

We have in the above chart three different formulæ for poultry mashes, with some difference in their nutritive ratios, but all three well adapted to be fed with mixed grains. The last, or No. 3, is the richest in protein, its nutritive ratio being about 1 to 2.3.

TABLE 14. — *Scratch Feed Mixtures.*

First.	Second.	Third.
200 pounds cracked corn. 100 pounds wheat.	300 pounds cracked corn. 200 pounds wheat.	200 pounds cracked corn. 100 pounds wheat. 100 pounds oats.

If you have barley or buckwheat, you can add 50 pounds of either, or 50 pounds of both, to any one of the above grain mixtures. The exact composition of a scratch feed should depend entirely upon the relative cost of the grains and the ease with which they can be obtained. As already noted, however, corn is the cheapest grain for poultry, and should form about one-half the scratch feed in any case.

Our method of feeding layers at the college is as follows: the dry mash is kept before the hens all the time. From 3.30 to 5 P.M., depending upon the time of the year, they are given scratch feed in the litter, about 50 per cent more than they will eat at once, so that they will have some left to work on in the morning while the attendants are watering and doing some of the other chores about the plant. In the morning, from 6 to 9, as the other work permits, they are fed more of the scratch feed; and this is all the feeding that is done under the dry-mash system. But since, as a rule, we wish to force our layers to the highest possible egg production, we also feed a wet mash once a day, about 2 P.M., which is a convenient time because it works in very well with the other duties of the attendant. The same formula is used for the wet mash as for the dry, but when we have no mangels, beets or cabbages we use cut alfalfa in the mash, making it compose about one-third of the bulk. Green or succulent food is given every day or every other day, in the form of cabbages, beets, mangels, turnips or carrots, which, as a rule, are split open and laid on the floor or in a trough for the hens to pick, though vegetables like carrots are usually run through a feed cutter and cut fine. Grit, oyster shell and water are kept before the hens constantly. Potassium permanganate, enough to give a good red color, is placed in the drinking water, especially in the fall, when the weather is very changeable and the hens and pullets are apt to take cold. It is a disinfectant, not a medicine, and a teaspoon level full is sufficient for 12 or 13 gallons of water.

The question is often asked how much to feed a flock of hens, 10, 20, 25, and so on. Those who have had experience know that this question cannot be answered definitely, as there are a large number of factors that govern the amount. The principal ones are as follows: the size of the hen; the activity of the hen; the number of eggs laid; ability to digest food; size of the eggs; kind of house; kind of treatment.

If any one will send us these data, we can answer the question fairly well, but without them it is impossible.

We know that hens eat about 50 per cent more in April, when they are laying heavily than in November, when they are moulting. In a general way, 10 hens will need on the average about 1¼ quarts of grain and 1¼ quarts of the ordinary mash per day, or about 4 ounces of feed per hen. Results obtained by the New Jersey Experiment Station conform very closely with this estimate, and Dr. Wheeler in his experimental work with hens, already referred to, came to about the same conclusion.

TABLE 15. — *Amount of Food consumed, Average per Hen per Year.*

	Pounds.
Grain and mash,	90.0
Oyster shell,	4.0
Dry cracked bone,	2.4
Grit,	2.0
Charcoal,	2.4
Clover,	10.0

This chart shows the amount of food annually consumed per hen at the Maine station, and the data were based on the average consumption of 100 hens for a year. It appears that each hen consumed about 100 pounds of grain, mash and hay, or just about 4 ounces per day, — a showing which should be of value in determining the amount of feed required daily for a given flock of hens.

What I have said above refers to feeding layers. In feeding breeders I would not use the same methods by any means. As previously stated, the main object in feeding layers is to get the highest number of eggs possible for the amount of grain fed, so they should be pushed to the limit. On the other hand, we are feeding breeders for an entirely different object. We want to get from them not merely eggs to be used as human food, but eggs containing strong, vigorous germs that will hatch well, and not only live but grow rapidly to maturity. We therefore must feed especially for vigor. The breeders should be separated in the fall from the layers, kept by themselves, and fed on dry mash and whole and cracked grains, given in deep litter. We do not want them to lay too many eggs in the fall and early winter because we believe this saps their vitality to a certain extent before the breeding season is on. If they are eating too much mash or laying too many eggs it is well to close the mash hopper during the forenoon and leave it open only afternoons. This will cause them to work harder for the feed, and keep them in much better condition for the breeding season. They should not be fed an excessive amount of animal food, as it has been found to be detrimental to the hatching ability of the eggs and to the growth of the chicks. The best kind of animal food for breeders is skim milk or buttermilk, which can be fed in large quantities without injuring them in any way.

TABLE 16. — *Data showing Effect of Various Animal Feeds upon Percentage of Eggs hatched.*

Pen Number.	ANIMAL FOOD USED.	Whole Grain (Pounds).	Dry Mash (Pounds).	Animal Food (Pounds).	Total Cost.	Total Eggs laid.	Cost per Dozen Eggs (Cents).	Per Cent Eggs hatched.	Cost per Chick (Cents).
1	Buttermilk, . . .	720	233	1,453	$18 16	2,040	10.68	55.0	1.61
2	10 per cent beef scrap in dry mash.	840	337	34	19 85	1,670	14.28	50.5	2.51
3	Beef scrap in hopper, .	900	216	141½	22 21	1,664	15.84	33.0	4.00
4	No animal food, . .	900	224	–	17 99	1,496	12.69	59.5	1.76
5	Green cut bone, . .	900	196	127¼	21 37	1,654	15.48	40.5	3.18

This chart shows the results of an experiment carried on at Guelph, Can., by Prof. W. R. Graham, head of the poultry department at that station. The best results were obtained, on the whole, from feeding skim milk, and the poorest results from feeding green cut bone and beef scrap in a separate hopper. This experiment covered a period from October to March, and all of the eggs laid by each pen, which contained 23 hens, were incubated.

From this and data from other experiment stations it is evident that in feeding breeders we should not feed too much animal food, unless in the form of milk; and not push them for high egg production during the fall and early winter, but give them plenty of exercise, free range if possible, and all the green food they want.

Feeding the broody hen is something that is sadly neglected by a great many poultrymen. I have been surprised to find that there are some who starve them for a number of days in order to break them up. This seems cruel to me, and also an expensive way of doing it. The main object of the poultryman is to bring the broody hen to laying again in the shortest possible time, therefore she should be fed on very rich feeds, and even tempted in every way to eat. So treated, most broody hens will begin to lay again in from ten to fifteen days. A stimulating mash should be given to these hens, if to no others.

In feeding poultry, the main thing after all is not the feed, the hens or the house, but it is the man with the feed pail. Hens may be overfed or underfed; they may be fed the wrong thing at the right time, or the right thing at the wrong time. The important factor in this work is judgment, and this can be used only by those who have had experience and know chickens thoroughly. I have seen men walk through their houses, feed their hens and never look at them. I once accompanied a man of this type through his house, and when we reached the other end asked what was the trouble with the hens in a particular pen, having noticed they had roup. The feeder replied that he had not noticed anything wrong, except that the hens in that pen were not laying as many eggs as the others. These men are automatic feeders, and feed as a matter of routine. We do not believe that a man can be successful with poultry who cares for them in this way. He should watch the hens eat as he throws out the grain, see if they are hungry, stir up the litter to see if they have eaten all he has given them previously, etc. One man has put it very nicely by saying, " When you go out to feed your poultry, take one pail of feed and two pails of judgment."

PRICES OF FEEDS AND POULTRY PRODUCTS IN YEARS 1898 AND 1913.

In periods of high cost of living, we are apt to think only of the prices of articles that we buy for food, and give no thought to the value of the raw material entering into those articles. For instance, we hear people speak of the high price of eggs, that the prices asked are beyond all reason, as they can remember a few years back when eggs cost only half as much as they do now. They naturally think that either the producer or the middleman is filling his pockets at the expense of the consumer.

TABLE 17. — *Relative Rise in Price of Feeds and Poultry Products, 1898 to 1913.*

Price of Feeds.

FEEDS.	WHOLESALE PRICE PER TON.	
	November, 1898.	November, 1913.
Corn meal,	$17 00	$32 50
Gluten feed,	17 00	30 00
Wheat middlings (flour),	17 00	32 00
Wheat bran,	16 00	25 50

Price of Poultry Products.

	WHOLESALE PRICE (CENTS).	
	November, 1898.	November, 1913.
Eggs,	26–28	59–60
Dressed poultry,	13–14	20–22

From this chart, showing a comparison between the price of feeds and poultry products for the years 1898 and 1913, we find that in 1898 corn meal was selling at $17 per ton and at present is $32.50; gluten feed, $17 and $30, respectively; wheat middlings, $17 and $32, and wheat bran, $16 and $25.50. The prices for 1898 were taken from a bulletin published that year at our agricultural college, and the 1913 prices were obtained from our local dealers on ton lots. It is evident from these figures that the prices have almost doubled in the last fifteen years.

In regard to the prices of eggs and dressed poultry, we found the following quoted in "Farm Poultry" for the month of November, 1898: —

Eggs (fresh), ...	26 to 28 cents per dozen.
Dressed poultry, ...	13 and 14 cents per pound.

For the year 1913 the following prices were obtained at the Boston markets, on the eighteenth day of last November: —

Eggs (fresh), ...	59 to 60 cents per dozen.
Poultry, ...	20 to 22 cents per pound.

From this it is seen that eggs have practically doubled in price in the last fifteen years, but that dressed poultry has not.

This comparison, on the whole, is not a very fair one, because we are taking the price of eggs when they are the highest of any period of the year, and poultry prices when they are the lowest, because at this time the market is flooded with all kinds of roasters, including hens, chickens, cocks, etc. This surplus is dumped upon the market for whatever it will bring.

Chickens in the Corn Field.

In husking and weighing the corn taken from one row across our patch at the college poultry plant this season, we found that the yield was 58 bushels per acre. We considered this an excellent showing, because corn was on the same ground last year, and the only fertilizer we used was about $1 worth of potash per acre. Poultry ran on the ground both last year and this. Furthermore, part of the land was cultivated only once during the season and the remainder only twice. Not a weed was to be found in the corn field at any time. The chicks were quite large when the corn was planted, and they were allowed to run on the land while it was coming up, but did not injure it at all, although some of them were about two months old at that time. There is no better place for raising chicks than in a corn field, as it not only furnishes feed for them but also shade, and the ground being cultivated, continually furnishes worms and bugs. The leaves of the corn act as a sieve and catch a great many bugs and insects from the air. These fall to the ground and are eaten. Moreover, the standing corn acts as a good wind break in the fall and fodder can be used for litter.

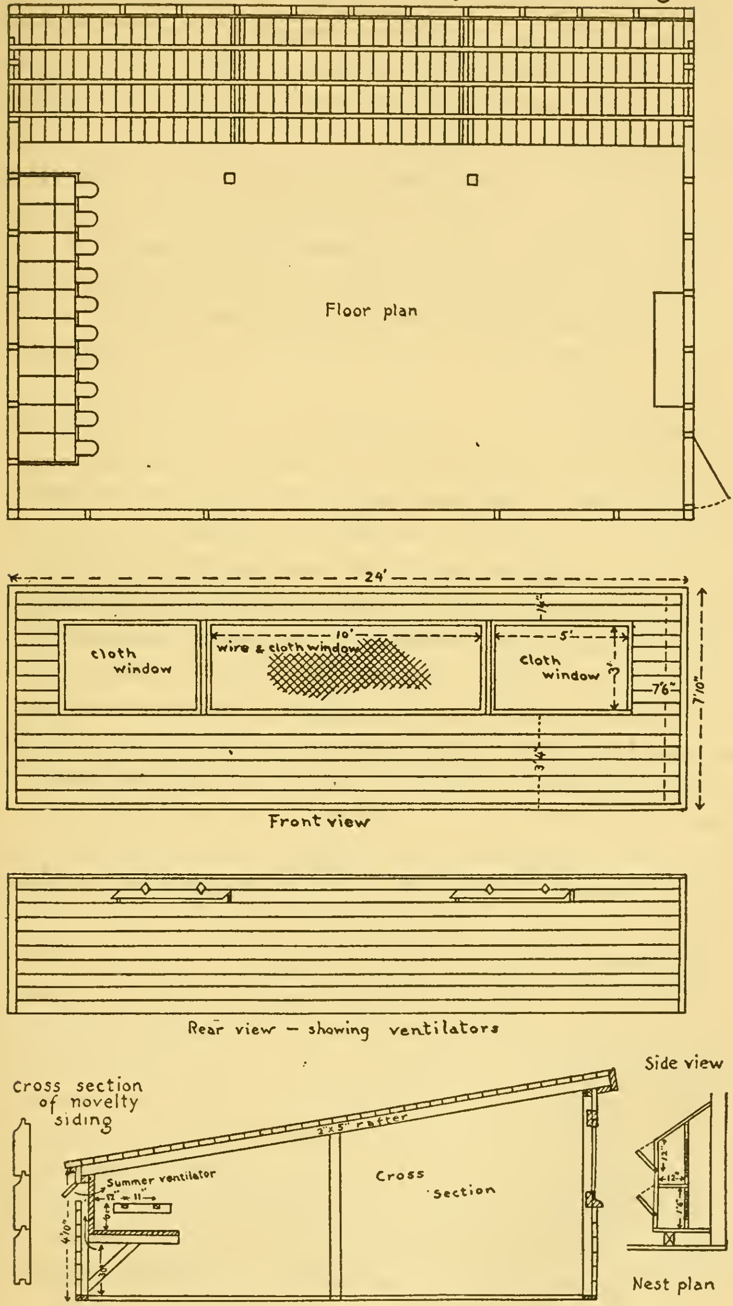
Any one who has land suitable for corn should by all means try to raise some in connection with the growing of young stock.

There has been considerable discussion as to the amount of poultry and eggs produced in this State annually, and also the amount consumed here. It is impossible to get at anything absolutely definite on the subject, but data secured by Dr. Brigham, author of "Progressive Poultry Culture," show that annually there are produced in Massachusetts about five million dollars' worth, while about twenty to thirty million dollars' worth are consumed. These data were secured several years ago, so at the present time we no doubt produce six million dollars' worth at least. An estimate of last year's consumption of poultry and eggs in Massachusetts, based upon the methods used in determining the amounts consumed in New York City, would give us about forty-seven million dollars' worth. Whether it is twenty-five, thirty or forty-seven million dollars' worth does not matter particularly, as the difference between production and consumption is great enough at any rate to assure us that the poultry business in Massachusetts is not overdone.

Secretary Wheeler. We hope that if anybody wants to ask Professor Graham any questions they will feel like doing so at this time. We would like to have a free discussion on the subject of raising poultry.

Question. I would like to ask Professor Graham which feed at this season of the year produces the greatest number of eggs?

Plans of Poultry House at the Agricultural College


Floor plan
24'
1½"
cloth window
wire & cloth window
10'
5'
cloth window
3'
7'6"
7'10"
3'4"
Front view
Rear view – showing ventilators
cross section of novelty siding
Summer ventilator
12"
11"
4'10"
2"x5" rafter
Cross Section
Side view
12"
12"
1'6"
Nest plan

Professor GRAHAM. Any one of the mashes that we threw on the screen, and two parts of cracked corn and one of wheat for scratch feed, fed in the way I mentioned, and plenty of green feed, will give you good results. Besides keeping a dry mash in the hopper, feed them a wet mash once a day, — all they will eat.

Mr. TOWNE. I would like to ask what kinds of grain you use for the dry mash, and in what proportions?

Professor GRAHAM. It is composed of 100 pounds of each of the following: wheat bran, flour middlings, ground oats, corn meal, gluten feed, beef scrap and linseed meal.

Mr. J. H. WHEELER. What time of day would you feed the wet mash?

Professor GRAHAM. We feed the wet mash about 2 o'clock in the afternoon, because it is convenient for the men to do it at that time. The exact hour of feeding is not an important factor. In general, I should say it should be fed at the period of the day that will fit in with the other work on the farm. The hour at which it is fed will determine the amount given at that particular time. As a general statement, the later it is fed the more you can give. If the hens will fill up on it early in the day the amount of exercise taken will be decreased, and whether breeders or layers, we want to induce as much exercise as possible. If the wet mash is given in the morning feed about half what they will eat; if at noon, a little more; and at night all they will eat.

Mr. LAPORTE. What do you think about feeding beet pulp?

Professor GRAHAM. It has just about the same feeding value as green beets, and you can feed it in the same quantities. We soak it first and feed it in a trough. A good many people mix up a mash with such material as beet pulp, cooked vegetables, etc., but in some way, for some reason, I never liked to do it; it never looked good to me — never looked as though I would like to eat it myself. (Laughter.)

Probably it is a notion of mine, but I would feed it in a trough. You can get the shredded beet pulp, which is very fine indeed. I think that is the better to buy; it soaks up more quickly. I would soak it overnight or for a few hours before feeding.

Mr. R. C. Goodale. What is your advice as to feeding wet mash, — whether warm or cold, with warm or cold water?

Professor Graham. The feeding of hot mashes is an old-fashioned idea. I began that way, but experiments have been performed at different stations which show conclusively that it doesn't make any difference whether you make them with hot or cold water. You probably know that the cooking of feed is being done away with entirely. Scientists have demonstrated to us beyond doubt that cooking binds up the protein molecules more tightly than in the raw feed. You try to fatten a cockerel on cooked feed and you will find you can't do it very well. Professor Graham of Guelph, Can., who has done a good deal of that work, because they furnish dressed poultry for the English market, has tried feeding cooked feed, but it has never been satisfactory. It gets the digestive apparatus of the bird out of order. Pouring boiling water into the pail of feed, enough of it to mix with the mash, wouldn't cook it but just warm it. The old-fashioned way was to make a sloppy mash, but now we put in just enough water to make what we call a crumbly mash.

Mr. Haven. In view of the tables, why do you use so much wheat, even, as one-third?

Professor Graham. We do it simply to get variety. In all probability they would get along very well on corn alone. Other grains should be fed simply for variety.

Mr. Haven. I know, but why can't you feed wheat and oats once a week? Wouldn't that cheapen your ration?

Professor Graham. Yes, sir.

Mr. Haven. And wouldn't that give an equal amount of variety? If they have corn and wheat together every day in the same proportion they don't really get variety.

Professor Graham. Looking at it that way, it is true; but I like to give what grains I feed quite regularly because of the habits of hens. They get into a habit of eating certain food and they like it. I have had hens that wouldn't look at corn, and others that wouldn't look at oats, barley or wheat. They thought they were weed seeds, I guess, until they learned to eat them, so that I would rather make my scratch feed of a variety of grains and feed regularly.

Mr. J. H. Wheeler. How about the use of buckwheat, where it is cheap enough?

Professor Graham. It costs too much money for what there is in it.

Mr. Wheeler. If you raise it yourself, and haven't a market for it, what then?

Professor Graham. I would rather raise the corn. Of course, I would feed it if I raised it, but I wouldn't go to work and raise either buckwheat or wheat.

Mr. Wheeler. In the part of Massachusetts where I come from we can't raise that kind of corn but once in ten years.

Professor Graham. Then I would raise the buckwheat.

Question. I would like to ask the professor whether he considers there is anything in the color of the corn that affects the color of the feather. In breeding white fowl, does white corn or yellow corn affect the color of the feather?

Professor Graham. Well, I do not believe it will. I want to try that out to my own satisfaction some time in feeding, but I do not believe it will do it. I will tell what it does, though. It colors the flesh underneath, gives it a very orange color, which might reflect somewhat upon the feathers, but I do not believe yellow corn would influence the pigment in the feathers themselves.

Question. Well, there is a considerable amount of fat in the quill of the feather.

Professor Graham. Yes, down beneath in the quill and about the quill of the feather.

Mr. Parsons. Is milk, or buttermilk, better for the mash than water?

Professor Graham. Yes, sir.

Mr. Laporte. Which food contains the largest amount of ash?

Professor Graham. You mean of our grains? Oats and barley. There is very little difference in corn, wheat and rye, but you will find more ash in oats and barley on account of the fibrous husks.

Mr. Worth. I would like to ask why you have changed the composition of your dry mash from a year ago last June. I was there and took your formula and liked it very much, but I see you have changed it somewhat.

Professor Graham. I can't give any reason for doing that.

Mr. Worth. But it is a fact, though, is it not?

Professor Graham. Well it is and it isn't. I simply made another mash, leaving out the ground alfalfa and compounding it in such a way that I could use 100 pounds of linseed meal and gluten meal. Any one of these three mashes I gave you will give good results; they are all good. By leaving out alfalfa meal we can feed our green material in another form if we want to. We have on hand at the present time a great deal of alfalfa hay.

Mr. Worth. Then you consider the mash you formerly used as good as the one you are now using?

Professor Graham. It is as good, in a way, but not quite so concentrated. There is no need of alfalfa in the mash if the birds are on range or are given it in another form. The third mash, the last one we compounded, has a greater per cent of protein in it, but I do not think that one would find any great difference in feeding them.

Mr. Worth. It seemed to me in feeding it that the proportion of ground alfalfa was large.

Professor Graham. Yes, it was, I think, one-sixth.

Mr. Worth. I do not know that it was, but it appeared so to me.

Professor Graham. Yes, it is one-sixth, but that is not very great when you consider that it is winter feed, and they don't get very much fibrous material outside of that except what they get in their beets and mangels.

Mr. Haven. Do you give your breeding stock any broader ration, any wider ration, in this form?

Professor Graham. Yes. The breeders get very little dry mash at this time and are being fed very largely, therefore, on a grain diet, — cracked corn and wheat and some oats.

Mr. Haven. Do you give your cockerels any different ration?

Professor Graham. Those we are keeping for breeding purposes we feed in the same way, about as we do the breeding hens. Those we are fattening, of course, we give a very fattening ration.

Mr. G. B. Parks. Did you ever feed cotton seed?

Professor Graham. We do not feed cotton seed because we don't know just how much we can feed. Another thing, cotton seed is rather fibrous compared with some of the other concentrates, and the fact that it will kill pigs if fed to them in quantities leads us to believe that we had better not feed very much to hens, because the digestive apparatus of the hens is very much more like that of the pig than that of the cow or the steer.

Mr. A. A. Warriner. I would like to ask a question in regard to fattening chickens and making growth. I want to find the best feed for getting large, nice, fat roasting chickens.

Professor Graham. Yes. You have reference to growing them particularly rather than to finishing them, have you not?

Mr. A. A. Warriner. Finishing them off, fattening them and getting them in good condition.

Professor Graham. In fattening there are three factors to consider; first, we want to select chickens that grew to maturity in good health and that will take on fat readily (it is a well-known fact among market poultrymen that there are certain ones that cannot be fattened); second, we must have the right kind of feed; and third, the proper method of giving it. The best ration for finishing is one part by weight of each of the following: corn meal, flour middlings, finely ground oats, and bran, mixed with some sour milk or buttermilk. If you haven't sour milk or buttermilk, put in about 10 per cent beef scrap and use water. It should be mixed to a creamy consistency, so that the birds will get a great deal of the milk. This can be fed twice a day in a trough, and a little cracked corn also can be given every day, if they will eat it.

Mr. Wentworth. I would like to ask if, in feeding sour milk, or in mixing feeds with sour milk, you ever have trouble from its being too laxative?

Professor Graham. I have never had any trouble of that kind. I think you will find that it has the opposite effect. If you feed sweet milk you won't get the results always that you will when you feed it sour. The reason we advocate sour milk is because of the effect that the lactic acid has upon the digestive tract, both of chickens and of man. There is nothing better for us than sour milk. You probably know that Metschnikoff, the bacteriologist, one of the greatest scientists that ever lived, noticed that the people in the Balkan Mountains and vicinity lived to an advanced age, and kept healthy and vigorous; he found also that they were making a drink of sour milk that contained much more lactic acid than we can get here in ours. They had a particular kind of bacteria that produced about three times as much acidity in the milk as our common lactic acid germs do, and he said it was on that account that those people lived to such a great age.

Mr. Worth. Would we get any better results by separating the curd from the whey?

Professor Graham. I don't think so. We want the whey because the acid is in it and there is very little in the curd. If you could separate them completely, the acid would all be in the whey.

Evening Session.

The chairman for the evening session was Mr. George E. Taylor of Shelburne Falls, who introduced Professor Sears of Amherst to speak upon "The New Orchard."

THE NEW ORCHARD.

PROF. F. C. SEARS OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Doubtless many in the audience are familiar with the Bay Road Fruit Farm, which is "The New Orchard" referred to in the title on our program, but it may be worth while for the benefit of those who are not, to state that it is an orchard at Amherst which was started in 1908 by Professor Waugh and myself, and which now comprises about 125 acres.

It is not my purpose to discuss all the problems that have come up in the development of this orchard, but rather to select a few of the more important, and those which are likely to be of more general interest.

First, a few words in regard to the character of the plantations which have been set. Many fruit growers consider that one line of fruit is sufficient, such as apples or peaches, and some even go so far as to say that if one is growing apples, a single variety, or two at the outside, will give the most profitable returns. As a general proposition this is probably true. It reduces the number of questions about which the owner must have expert knowledge, and allows him to concentrate on a few lines; and every one will agree that the profits from many orchards have been reduced owing to the multiplication of varieties. But it has seemed to us that there was another and very important side to the question, and that is the better distribution of the labor required where one plants several varieties of any fruit and several different kinds of fruit. For example, if a man ties up to the Baldwin apple, which all will agree is the most profitable single variety of any fruit, he has three or four seasons of the year during which he is rushed with work. These

Barley as a cover crop.

are the seasons of pruning, spraying, picking and cultivation (if he cultivates). During the balance of the year he has practically nothing to do in his orchard. On the other hand, if he enlarges his list of varieties, and still more if he includes several classes of fruits in his plantings, his season for labor is very decidedly extended. In the matter of picking, for example, instead of having it all come in two weeks, the last of September and the first of October, his picking season extends from the last of July to the middle of October, which is a very decided advantage. Another point which has influenced us in increasing our list of varieties somewhat, and in planting other fruits than the apple, is that this enables one to hold his customers better. One customer may want Sutton, another Wagener and another Palmer Greening. For the grower who is catering to a personal market, the ability to offer a choice of varieties is certainly worth considering.

Looking at the subject in this way, while we have made apples our leading fruit, we have also set peaches, pears, plums and quinces, and we expect to add grapes and cherries. Our list of important varieties in apples is, in the order of ripening: Yellow Transparent, Red Astrachan, Oldenburg, Wealthy, McIntosh, Hubbardston, Sutton, Palmer Greening, Wagener, Rhode Island Greening and Baldwin. Of course we have set many more trees of some of these than of others. Probably five-sixths of the plantings are made up of Baldwin, McIntosh, Wagener, Rhode Island Greening and Palmer Greening.

In peaches we have set: Greensborough, Carman, Champion, Belle of Georgia and Elberta. This gives a good succession, though not a perfect one. There are breaks in the line which we want to fill in; and we especially need a variety that is later than Elberta.

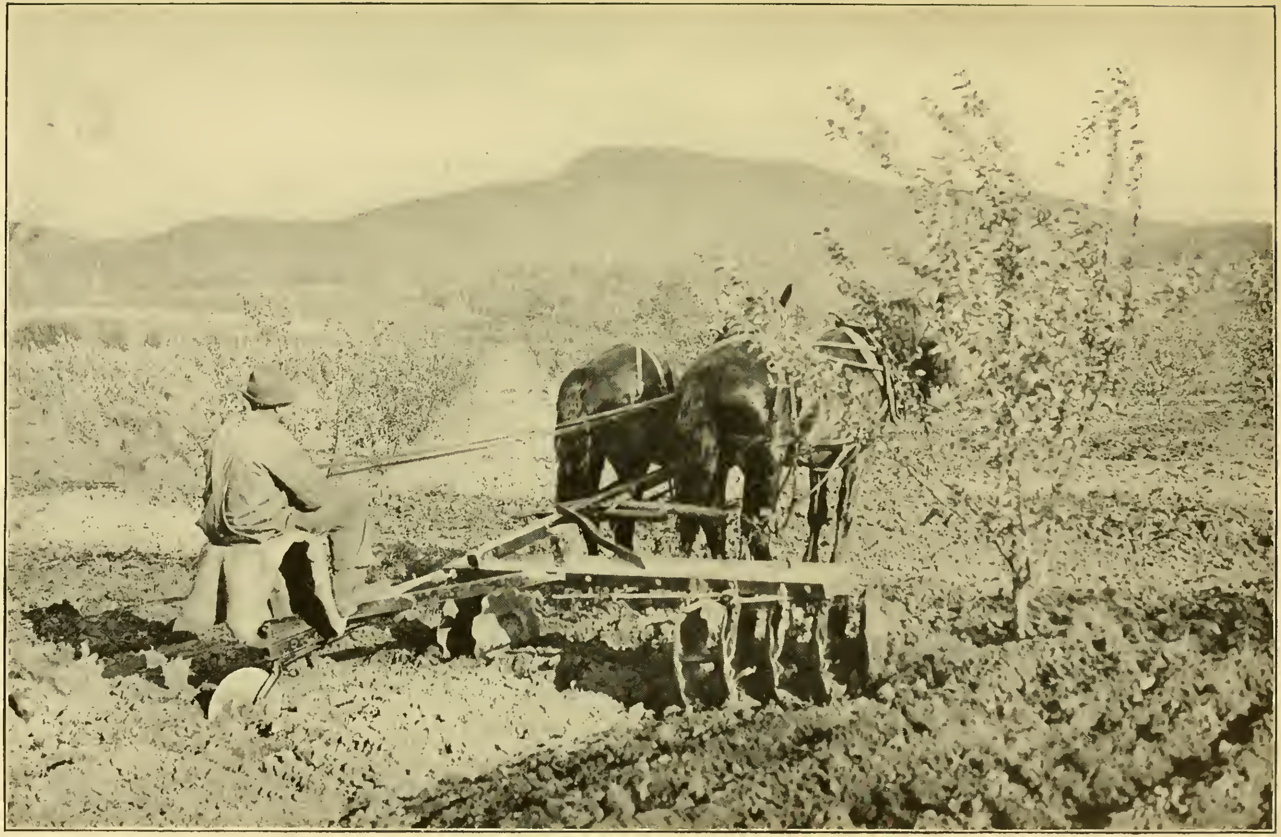
A question which we have found it very difficult to settle is what crops to grow among the young trees during the first few years of the orchard. To be satisfactory a crop must first of all leave the trees in at least as good condition as they would have been without it, and second, it must be profitable to the owner. This is a difficult combination to get; at least, we have found it so. To be a benefit to the orchard the crop must require good cultivation, and must not spread out so as to shade the trees or rob them of food; and it is very desirable, also, that it should make its greatest growth at a different period from the trees. In order to be profitable it must be a crop which the owner can use to advantage on the farm or which he can sell for cash. As we keep no stock, other than our teams, there is little that we can use except hay and corn, and of course hay cannot be grown in an orchard. We have not considered it advisable to go into truck crops, and we are therefore restricted to general crops that can be sold for cash. Those which we have found most satisfactory under our conditions are: beans, soy beans, corn, potatoes, cabbage, squash, strawberries. Even strawberries we find objectionable in any but very young orchards because they prevent cross-cultivation, and still more because they require to be kept in the land two years. It is impossible to keep the young trees in as good condition where the land cannot be given a thorough preparation in the spring.

Another question which has caused us no end of difficulty, and which we have not yet solved to our entire satisfaction, is the old, perennial question of cover crops. Many people think this question was settled years ago. As a matter of fact, it never was settled, and probably never will be except as each man settles it for himself, and that temporarily. The most important offices of a cover crop are the following, arranged roughly in the order of their importance: —

1. To add humus to the soil.
2. To prevent washing of the soil.
3. To check the growth of the tree.
4. To add nitrogen to the soil.

In addition to this, if the crop is to be used on an orchard of any size, and if the owner is not a millionaire, the seed must be reasonably cheap.

It might seem like a relatively simple matter to grow a good crop of some plant in the soil in the early autumn which shall accomplish all of the things mentioned above, and not be very costly, but in our case, at least, it has not proved so. Our soil is relatively light, which probably makes it more



The California orchard plow.

difficult to grow good crops, and it was badly run out when we began, which undoubtedly complicates matters. At the present time the following are our most promising crops: buckwheat, barley, dwarf Essex rape, turnips, soy beans and rye. The great advantage of buckwheat is that it will grow almost anywhere and that it leaves the soil in fine condition. Also that it tends to reseed itself from year to year, so that one saves on the bill for seed. This is a very important point, and I believe that by changing our methods a little we can get cover crops that will almost always reseed themselves. The change in methods would be principally in the direction of shortening the season of cultivation, so that not all of the seed will have sprouted before it comes time to "lay by" the orchard. Another practice we have found helpful in getting a good growth of cover crop is to apply a little fertilizer when the cover crop is sown. In fact, we are even contemplating changing the time for applying our orchard fertilizers from early spring to the date at which the cover crop is sown, for of course in the long run the trees get the plant food which is taken up temporarily by the cover crop.

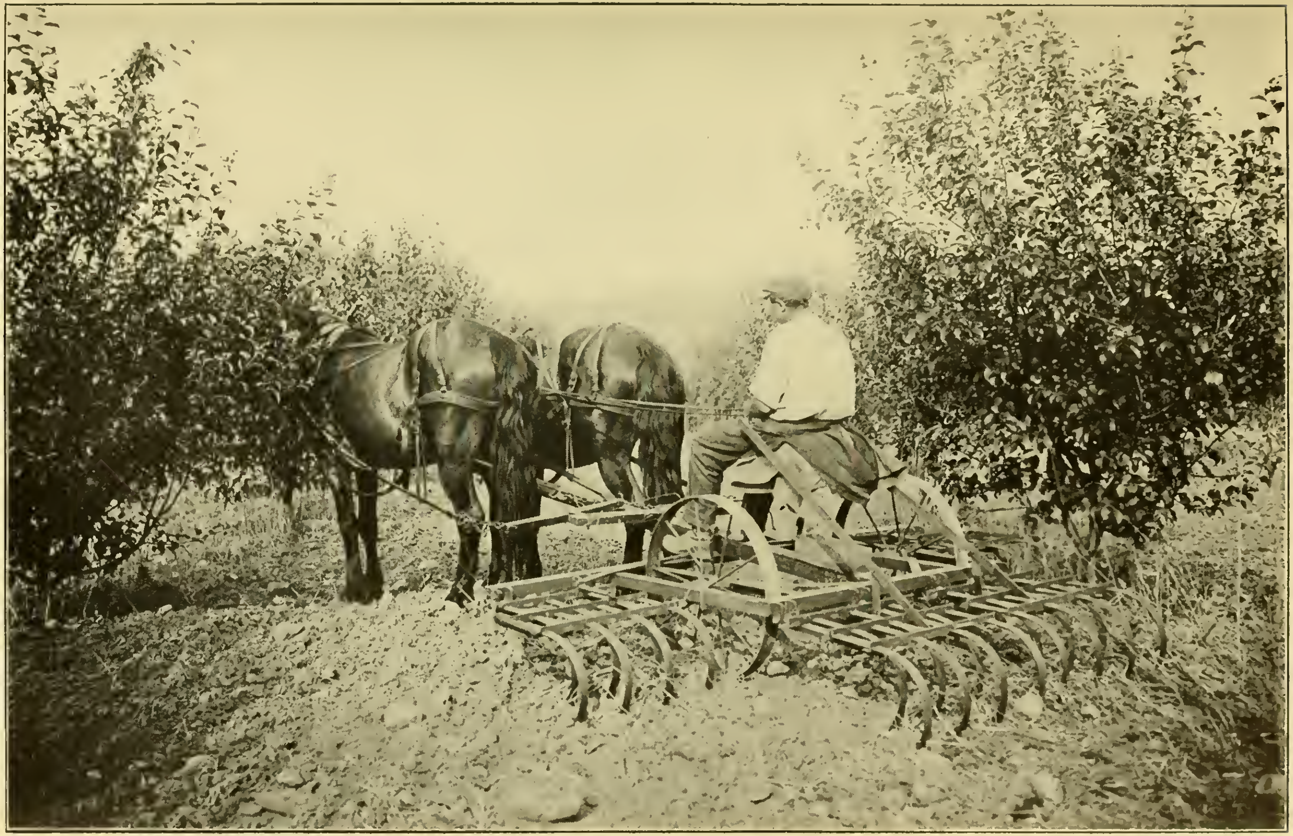
A point in favor of turnips and dwarf Essex rape is the low cost of seed. Two pounds will sow an acre, and the former costs about 35 cents a pound, while the latter can be had for about 8 cents. Where one is sowing a large acreage this low cost of seed looks very attractive. A further advantage of turnips is that under anything like favorable circumstances a good many of them will grow large enough to be marketable. One can then go through the patch and pull out enough to more than pay for the cost of the crop, and still have a good stand to act as a cover.

It might be of interest to say just a word about some of the orchard implements that we are using, because in the handling of an orchard our success depends to a great extent on what sort of tools we have to work with. While we have a great many different implements, the three which we use most are the "light-draft orchard harrow," the "California orchard plow" and the "orchard cultivator." The first mentioned is a light form of spring-tooth harrow, mounted on wheels, and it comes nearer to doing all the work in the orchard in one day than anything else I have ever seen. Our teams have done as much as 20 acres in a day with this harrow. The California orchard plow consists of a gang of four discs at the end of a long beam, and its strong point is that one can get close up to the trees with the plow and still keep the team well away. We have found it better than any other plow we have yet tried. The "orchard cultivator" is an implement with rigid teeth, and is especially useful where there is hard work to be performed; that is, where the soil is heavy and the weeds are bad. Under such conditions the light-draft harrow will not work satisfactorily.

A practice which has become a regular thing in our orchards is thinning the fruit. I believe that it is hard to overestimate the value of this operation. It not only gets rid of the poor, defective specimens that would be of little or no value at picking time, and so relieves the owner of the necessity of deciding what to do with them, but it also relieves the tree of the strain of developing these fruits to maturity, and consequently makes annual crops more probable.

Many people are deterred from thinning by the idea that it is an endless and costly job. Our advice to such people would be to try it. We have had our thinning done principally by boys about fifteen years of age, and we find it costs us about 40 cents per tree to thin the fruit on full-sized bearing apple trees, and about 2 cents to thin a peach tree that will bear two to three baskets. With the apples our practice is to go over the tree twice, the first time about the 10th of July and the second time a month later. The first time our orders are to thin so that no spur will have two apples. Defective fruits are also removed. The second time we look especially for defective fruits, but also thin out where the fruit looks thick. I do not believe any other practice, with the exception of spraying, is more important if one wishes to grow the best fruit.

I cannot let this opportunity pass without mentioning the record of a small Baldwin orchard that was on the land when we bought it. The trees are probably thirty-five years old, and were so poor that it was seriously suggested that they



The light-draught orchard harrow.

should be cut down and a "real orchard" set in their place. But instead of this they were pruned and fertilized and sprayed, with the result that the third year they bore 200 barrels of apples and the fifth year 175 barrels, for which we were offered $1 more per barrel than the market price, on account of the quality of the fruit. There are hundreds of old orchards in the State that would do as well if they were given the same treatment.

We start in the spring with pruning and dormant spraying, and this is followed by spraying our apples for codling moth. If we had only peaches we should omit this spraying. Then later on we spray our peaches with self-boiled lime-sulphur, at a time when there is little to do in the apple orchard. Then all of our lower lands are seeded down to hay, a crop that lends itself admirably to the profitable distribution of labor, because haying comes in just as we are through spraying and is out of the way just in time to begin picking the earliest peaches.

Now a few words in closing about marketing our fruit. We have worked principally to develop a family trade in fruits, and personally I believe that this is by far the most valuable kind of trade. I had rather sell a man five barrels of apples at $4 a barrel than two boxes at $2.50. On the other hand, we must not overlook the fact that the less fruit one sells a customer at one time the more that customer is willing to pay. At two apples for 5 cents (a very reasonable price where one is buying a few apples to eat) a barrel of apples (estimated at 350 apples) will sell for $8.75. In fact, I believe that if growers could persuade their groceryman to handle the fruit on a commission, some form of small basket or carton would be very profitable. This plan not only gives the advantage of better prices to the grower, but it gives him a certain control over the price, which is very desirable.

Mr. Taylor. Where would you prune a two-year-old tree?

Professor Sears. I wouldn't prune it at all until next spring.

Mr. Taylor. But in the spring where would you take the top off?

Professor Sears. Way down in here somewhere (indicating).

Mr. Taylor. Doesn't the nitrogenous quality of Winter Vetch somewhat overbalance the cost of it?

Professor Sears. Yes, it would. That is a point I thought of but haven't emphasized. Yes.

Question. What do you do with the fruit you thin out?

Professor Sears. We haven't done anything. Even the second thinning is so early that it has no value; the fruit at the second thinning is still so small and immature that I don't think it will bother you. I think you will find the greatest difficulty is to get your men to thin it enough. The tree looks fearful when you get through; the ground is covered with fruit, and it doesn't seem that there is any left on the tree, but when you come around to picking time I think you will wish you had thinned more. I think that is the experience of every one who has thinned, that he couldn't get his men to thin enough; but if you can get the boys to realize that they are your trees and realize what the purpose is, and you can get them to carry out instructions until there is only one fruit left on the spur, you will be surprised at the result.

Mr. Taylor. I was very much interested, when I went over your orchard, in seeing the development of fruit spurs on what we call the water sprouts in the center of the tree.

Professor Sears. In the old trees?

Mr. Taylor. Yes. It was something new to me.

Professor Sears. The chairman calls attention to the fact that we have been able to develop fruit spurs on a lot of the water sprouts. That has been rather good, I think. Commonly we wouldn't have satisfactory development of fruit spurs, and so we took the water sprouts, and undertook to develop paying wood, or fruit spurs, on those, and we have been reasonably successful, I think.

Mr. Taylor. How long do you run those fruit spurs? Do you leave the stubs more than two years?

Professor Sears. The idea is simply this: if you have an old tree where the small branches have been cleaned off so that it isn't paying, so that you are getting no return from that section of the tree, the only way you can get it back is by developing the water sprouts and developing fruit spurs on the sides of those, and after those come up go right down to perhaps within two or three inches and make them throw outside shoots, and the tree will start bearing, and if we find that it isn't doing as well as it should, we cut them out.

Mr. Gleason. I would like to ask the professor what fertilizer he uses on these orchards.

Professor Sears. I might say that we very strongly believe in the practice of fertilizing orchards, and those of you who have kept track of the recent discussions on fertilization know that the results in the different stations have been very varied. They have run all the way from the Pennsylvania station, which has shown very marked advantages from fertilization, to the work at Geneva, N. Y., where they concluded that they didn't find any virtue in it, and not only that, but they didn't get the money back that it cost to put the fertilizer on. There is one other experiment that ought to be recorded, and that is at Amherst. where we have planted primarily to test the advantage of different forms of fertilization by potash. I won't enter into that question now, but, incidentally, in the center of that orchard was a block that didn't receive any fertilizer, and the result has been that that block which didn't receive any at all has been way behind the other blocks. No matter what fertilizer has been put on, those others have been way ahead. To my mind, that, and the Pennsylvania station experiment, are proof enough that under most circumstances fertilization is a good thing, and that has been the way in which we have handled our orchard. We have not only put on nitrogen for our young trees to start off with, but we have gone on the assumption that it was a good thing and would encourage them in coming into bearing. We have furnished also potash and phosphoric acid for our young trees. We have used nitrate of soda, a couple of ounces, perhaps, to each tree, and acid phosphate and high-grade sulphate of potash, making them up at the rate of 5 pounds of phosphoric acid and 3 pounds of potash. On the old orchard that we renovated we have used each year 500 pounds of basic slag and 300 pounds of potash, and on all our orchards we have used a good quantity of fertilizer, almost always in these forms that I have mentioned; that is, we used basic slag, as a rule, on the old orchards that were cultivated, and always high-grade sulphate of potash; and for our young trees we usually used acid phosphate or phosphoric acid; and then we have used lime as I have suggested, more on crops than on the orchards. I think that is very important for the trees, particularly on land that has been seeded down.

Mr. Taylor. How much lime do you use?

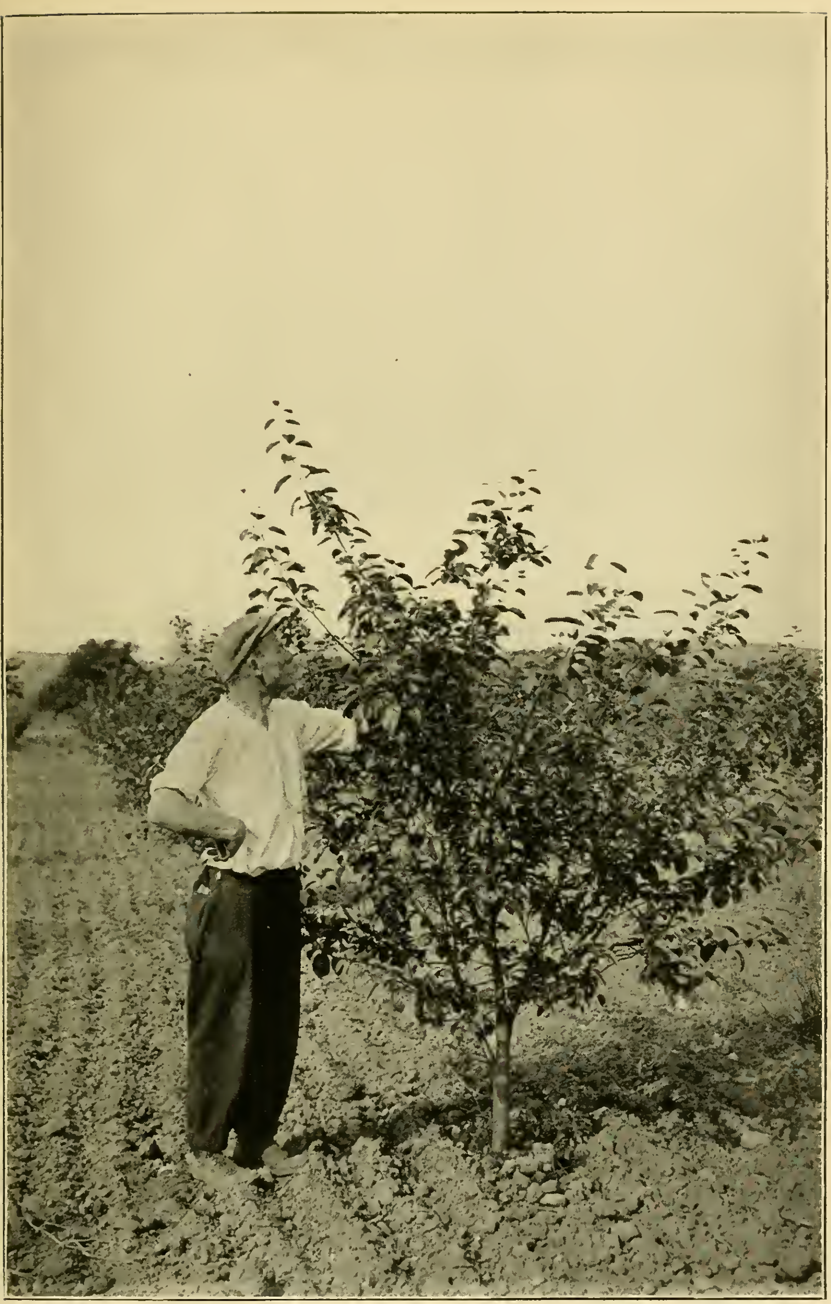
Professor Sears. We have been putting on a ton per acre. I know that Mr. Haslett at the station said that some persons said it would require 5 tons per acre, but I wouldn't advise putting on that quantity. Put on a ton per acre to start with.

Mr. William Hanson. Did you ever see a man cutting a McIntosh tree? I set out an orchard two years ago with McIntosh fillers, and I had a man tell me this summer that he never had the heart to cut his out. I am going to set out another orchard next spring, and he advises me to put them in blocks and not use the McIntosh for fillers, because I would never have the heart to cut them out.

Professor Sears. Well, that is coming right back at me, certainly. I have never seen a man cutting out McIntosh, but I have seen men cut out Wagener and Wealthy, and if I had the heart to cut out Wagener I think I would have the heart to cut out McIntosh. I quite appreciate the difficulty, and I am quite certain that perhaps the rank and file won't have the grit to cut them out. My idea is that if we find we haven't the grit to do it, we can have the hired man cut them out while we are gone. [Laughter.]

Question. I would like to ask what percentage of wood you would cut out on an old orchard when renovating it?

Professor Sears. That is a question that it is impossible



Heading back a four-year-old apple tree.

to answer. It would go, I should say, all the way from 90 per cent down to perhaps 4 or 5, depending on the condition of the tree. In our work in renovating we started in and cut out dead wood, and if you have a particular tree in mind, you will know how much will be left on the tree when you get through with it. My boys have been working for the last three weeks on renovating old trees, and they were instructed to cut out the dead wood. I was talking it over with the class to-day, and we agreed that the cutting ran all the way from 16 up to 50 per cent dead wood, so you see there is considerable variation according to the tree itself. Then, after you have got the dead wood out, the question comes up what else to do; but after you have cut out, say, 60 per cent, that is about the time you quit; there isn't much of anything left. But in an ordinary tree of the type I have seen renovated, I should think it would run somewhere around 25 per cent. Of course, it is impossible to say without knowing what the tree looks like.

Mr. Brennan. I would like to ask the professor if I understood him correctly when he said they were considering fertilizing cover crops? Is that fertilizing coming at a time when it will introduce a growth of new wood?

Professor Sears. I am glad you raised that point. We don't at that time put on any great amount of nitrogen to start with, but the cover crop will use up most of the nitrogen. Then, you would not get very close to the tree with the fertilizer. If you wanted to get it satisfactorily you would keep away from the tree with the fertilizer. We have tried it to a limited extent, but the dressing of nitrogen, or whatever we were using, would be relatively light.

Mr. Hanson. I would like to ask what kind of fertilizers will give color to apples.

Professor Sears. Why, I don't know. I doubt if any one knows. The men here in this audience are better qualified to discuss that than I am, but the latest evidence I have heard seems to be rather against the view that any fertilizer actually gives color. You can destroy it by the use of too much nitrogen, but evidence seems to be lacking to absolutely prove that you can increase it, unless possibly by the use of potash.

Mr. George Packard. On the question of filler trees, I would like to ask why peach trees couldn't be used, which live but a few years naturally, anyway, instead of apple trees, which are valuable. I think it is almost a crime to kill a Wealthy tree.

Professor Sears. Yes, peach trees will die in several years, and if it will ease your conscience any, that might be better for you, Mr. Packard. Still, I don't think it is any more of a crime to cut out a McIntosh tree than it is to go into that McIntosh tree and then cut whatever limbs are necessary. The two stand right together. I know a man feels a little worse about cutting out a tree than he would about cutting out some limbs.

To answer the other question about peach fillers, that is a legitimate practice, and a good many people do it. We have done it ourselves, but I have two objections to it, and I think they are legitimate objections. The first is that you quite frequently come to a point where you want to handle the soil differently for the peaches than for the apples, particularly in the matter of the fertilizers which contain considerable nitrogen. Here is a good illustration which comes to my mind now. The college has a block of apples, interplanted with peaches, trees about eighteen years old. In 1906, I think it was, the peaches were much damaged by a hard winter; and after a severe pruning in the spring it was desired to push the peaches along, and so they were given a good application of nitrate of soda, which the peaches wanted, and some of the trees are still in good shape in the orchard now. The apples, however, which include McIntosh and Wealthy and Baldwins and various standard sorts, were just coming into bearing nicely, and they didn't want any nitrogen; it was just what they didn't want. Well, the result was that they started off to a big wood growth, and have been trying to get over that ever since. That was six years ago, and they are just getting sobered down where they would have been if it hadn't been for that nitrate of soda. So I think that it is an objection; that you frequently come to a point where you want to treat the soil differently for peaches and for apples.

Another objection is one also frequently noted, that you want to spray with different material or at different times, and you have got to go back and forth from one tree to the other, and if you simply make up your mind to do it at different times, it means you have got to go over the orchard twice, which adds to the expense. Those are my reasons for not liking it, but I have seen it overcome in a number of cases and have put in peaches, but I don't think it is the best practice, and I entirely agree with the gentleman who said it is best to put a tree in and when you get through with it cut it out.

Mr. Irwin. Don't you consider the McIntosh better than the Baldwin to-day, for money?

Professor Sears. Well, I don't know. Yes, to a limited extent I consider it better, but I am a great friend of the old Baldwin, myself. It is an apple to tie up to week after week and night after night. The Baldwin is as good as anything you get.

Mr. Irwin. But it doesn't bring the price.

Professor Sears. No, I know it doesn't bring the price. I don't want to say anything against the McIntosh, because I think it is a fine apple.

Mr. Packard. I would like to ask this as to fertilizers. If the peach-tree fertilizer harms the apple trees next to them, why couldn't the application of fertilizer be made locally? Some years ago I set out an orchard with peach trees in between, and in due course the peach trees died. The apple trees came right along as well as could be expected of any apple trees, and I lost nothing by it.

Professor Sears. The difficulty is that the roots don't stay where they belong; the peach-tree roots go right among the apple roots, and the apple-tree roots go right among the peach-tree roots, and if you have these trees 20 feet apart, at the age when the fertilizer would be applied, undoubtedly the apple roots would be trying to occupy all the soil, and so would the peach roots, so that when you put any fertilizer on it would be on both of them at the same time.

SECOND DAY.

The Wednesday morning session was called to order by Secretary Wheeler at 10.40 A.M. Mr. Herbert G. Worth of Nantucket was introduced as chairman of the morning session. Mr. Worth called upon Professor Warren of the New York State College of Agriculture, Ithaca, N. Y., for the leading address of the session.

THE MOST IMPORTANT FACTORS IN SUCCESSFUL FARMING.

G. F. WARREN, PROFESSOR OF FARM MANAGEMENT, CORNELL UNIVERSITY.

During the past six years we have been securing from farmers in New York State records of their capital and business receipts and expenses, in order to find out how much farmers are making, and why some are making more than others. During this time we have obtained records of 2,917 farms.

From seven years' study of this question we have determined the relative importance of different factors on profits.

Labor Income defined.

In order to understand this discussion it will be necessary to know what is meant by labor income. By this we mean the amount of money that the farmer has made in addition to interest on his capital. It corresponds to a hired man's wages when the hired man receives a house and some farm products.

Table 1 shows the averages for Tompkins county.[1] The average capital on these farms was $5,527. This includes land, buildings, stock, machinery, tools, feed and seed on April 1 and cash to run the farm. The average receipts for the year were $1,146. Any unsold products or increase in animals is counted as a receipt. The average expenses were $389. This includes all business or farm expenses. It does not include any personal expenses, but includes the value of board furnished to hired help. The difference between the receipts and expenses averaged $757.

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[1] For a fuller discussion of methods of work and other conclusions, see Bulletin 295 of the Cornell Experiment Station. The purpose of this work is not to compare farming with city work, but to study the relation of various factors to profits in farming. The hired man and the farmer get many farm products from the farm. These and very many other factors must be considered in order to compare farming with city work. Labor income is an excellent means of measuring the success of a farmer, as it is directly comparable with hired man's wages when the man gets a house and farm products.

TABLE 1. — *Averages, Tompkins County.*

Number of farms,	615
Average capital,	$5,527
Average receipts,	1,146
Average business expenses,	389
Receipts less expenses,	757
Interest at 5 per cent,	276
Income from unpaid labor,	481
Value of unpaid labor except owner's,	58
Labor income,	423

This $757 was earned by the farmer's money and the work of the family. Money can readily be loaned on farm mortgages at 5 per cent. Hence, only $481 can be said to have been earned by the labor of the farmer and his family. The unpaid farm labor by members of the family would have cost about $58 if it had been hired. The farmer really earned as his wages $423. This we call his labor income. Hired men in this region get about $360, house rent and some farm products. If a farmer's labor income is less than this he might as well lend his money and hire out.

About one-third of the farmers in Tompkins County are making less than hired men's wages; one-third are making wages; and one-third make more than wages.

Table 2 shows the same results for Livingston County. The region is a very prosperous one and gives an average labor income of $584.

TABLE 2. — *Averages, Livingston County.*

Number of farms,	574
Average capital,	$10,548
Average receipts,	2,172
Average business expenses,	980
Receipts less expenses,	1,192
Interest at 5 per cent,	527
Income from unpaid labor,	665
Value of unpaid labor except owner's,	81
Labor income,	584

Most Important Factors affecting Profits.

The four most important factors affecting profits have been found to be size of business, crop yields, production per cow or other animals, and diversity of the business. So strikingly do these four factors stand out that if we know them we can guess the labor income with approximate accuracy in about 95 per cent of the cases. Only in a few cases do practical farmers make other mistakes of so serious a nature as to prevent them from getting a good labor income when these four factors are favorable.

Farms not balanced. — Farmers are like other people, — they have hobbies. There is practically no relationship between good cows and good crops, or between size of the farm and production of crops or cows. We find that the farmers who have the best cows average very little above their neighbors in crop yields. That the crops are good gives no indication of whether the cows are good or bad. On the average, there is practically no relation either between the size of the farm and quality of the crops or cows. As a result we have all kinds of combinations of the factors of profits. There are very few farms that rank well in each of the four respects.

Size of Business. — There are many ways in which the size of the business may be measured. Farms may be compared on number of days of work done, number of men kept, amount of capital invested, number of cows or other animals kept, number of work animals, number of acres of land, or acres of crops grown. So long as we are dealing with fairly uniform conditions each of these comparisons will give about the same results as an average of large numbers; but when a particular farm is considered it may be placed in a different class when the method of sorting is changed.

Relation of Capital to Profits. — Tables 3, 4, 5 and 6 show the relation of capital to profits. The farmers in either of these counties who do not have a capital of at least $5,000 are not doing as well as hired men. In Tompkins

TABLE 3. — *Relation of Capital to Profits on 615 Farms operated by Owners, Tompkins County, N. Y.*

CAPITAL.	Number of Farms.	Average Labor Income.
$2,000 or less,	36	$192
$2,001 to $4,000,	200	240
$4,001 to $6,000,	183	399
$6,001 to $8,000,	94	530
$8,001 to $10,000,	45	639
$10,001 to $15,000,	44	870
Over $15,000,	13	1,164

County over one-third of the farmers had less than $4,000 capital, but not one of these made a labor income of $1,000. About two-fifths of the men with $10,000 capital made over $1,000 labor income. The figures for all the other regions show the same results.

TABLE 4. — *Comparison of Profits on Same 615 Farms.*

CAPITAL.	Number of Farmers.	Per Cent of the Farmers making Labor Incomes of Over $1,000.
$2,000 or less,	36	–
$2,001 to $4,000,	200	–
$4,001 to $6,000,	183	8
$6,001 to $8,000,	94	14
$8,001 to $10,000,	45	22
$10,001 to $15,000,	44	32
Over $15,000,	13	46

TABLE 5. — *Relation of Capital to Labor Income on 578 Farms, Northern Livingston County, N. Y.*

CAPITAL.	Number of Farms.	Average Labor Income.
$5,000 or less,	87	$291
$5,001 to $7,500,	80	407
$7,501 to $10,000,	112	480
$10,001 to $15,000,	164	769
$15,001 to $20,000,	62	1,001
$20,001 to $30,000,	55	1,062
Over $30,000,	18	1,691

TABLE 6. — *Comparison of Profits on Same 578 Farms.*

CAPITAL.	Per Cent of the Farmers making Labor Incomes of Over $1,000.
$5,000 or less,	7
$5,001 to $7,500,	11
$7,501 to $10,000,	16
$10,001 to $15,000,	33
$15,001 to $20,000,	46
$20,001 to $30,000,	51
Over $30,000,	50

Relation of Amount of Labor employed to Profits. — If we measure size of business by number of men, or total value of labor directed, we find the same comparisons. Those farmers who do not direct at least one man besides themselves do not, on the average, earn much more than farm wages. Table 7 gives such a comparison for Tompkins County, N. Y. The total value of labor directed includes the farmer's labor, estimated at $326 for the year, this being the average price that farmers estimated it would cost to hire the labor done. If the total labor directed does not equal about $650 to $700, the farm does not employ one hired man for full time besides the farmer.

TABLE 7. — *Relation of Labor to Profits.*

VALUE OF TOTAL LABOR.	Labor Income.
$347,	$288
426,	332
557,	432
730,	534
960,	721
1,307,	1,194

Relation of Size of Farm to Profits. — A better measure of size of business is the acreage farmed, or better still, the acreage of crops grown. Tables 8 and 9 give such comparisons for general farming where hay, grain, potatoes, cabbage and apples are the usual crops, and where a considerable proportion of the farmers keep dairy cows.

TABLE 8. — *Relation of Size of Farm to Profits, 586 Farms, Tompkins County, N. Y.*

ACRES.	Number of Farms.	Average Size (Acres).	Average Tillable Area (Acres).	Labor Income.
30 or less,	30	21	18	$168
31 to 50,	108	49	38	254
51 to 100,	214	83	60	373
101 to 150,	143	124	88	436
151 to 200,	57	177	117	635
Over 200,	34	261	160	946
Average,	-	103	-	$415

TABLE 9. — *Relation of Size of Farm to Profits, 578 Farms, Livingston County, N. Y.*

ACRES FARMED.	Number of Farms.	Average Size (Acres).	Tillable Area (Acres).	Labor Income.
30 or less,	17	20	17	$54
31 to 50,	35	43	37	295
51 to 100,	147	79	64	437
101 to 150.	178	127	104	593
151 to 200,	89	175	142	934
Over 200,	112	305	241	1,082

In these regions the average farmer with less than 50 acres would make more money if he sold his farm, lent his money and hired out as a farm laborer, or better yet, became a tenant on a larger farm; or in many cases he might better go in debt for a large farm and own it.

Comparatively few farmers with less than 100 acres made very good profits. Of the 551 farmers who farmed 100 acres or less, only 6 made labor incomes of $1,500. But of 292 farmers who farmed over 150 acres, 60 made over $1,500.

Relation of Acres of Crops to Profits. — A still better way of measuring size is to compare the area of crops grown. This includes all harvested crops, but does not include pasture. Table 10 gives such a comparison.

TABLE 10. — *Relation of Acres of Crops to Labor Income.*

ACRES OF CROPS.	Average Acres of Crops.	Number of Farms.	Labor Income.
20 or less,	14	18	$24
21 to 40,	31	55	257
41 to 60,	51	95	400
61 to 80,	69	115	481
81 to 100,	90	96	642
101 to 140,	118	112	937
Over 140,	193	88	1,261

Most of the economies in production are dependent on the area of crops grown. Five horses are enough to raise 100 to 150 acres of general farm crops when the crops consist of a good combination of grain, hay and potatoes, apples or cabbage. If the crops are of the above kinds there should be at least 20 acres per horse, but if they are hay and grain there should be at least 30 acres per horse. In the eastern States the cost of horse labor per acre is more than the interest on the value of the land. While five horses can raise 125 acres of crops it is difficult to raise 50 acres of crops with two horses. Farm machinery is built on the two, three and four-horse basis. Evidently if one has less than 80 acres of crops he must either go without good machinery or must keep too many horses. There is no other solution of the problem for him.

Machinery, horses and labor cannot be used efficiently with less than 80 to 100 acres of crops; and 200 acres is still better. The various reasons for this have been published elsewhere. For this discussion it is sufficient to see that size of business is very important and that crop acres is one of the best measures of size.

The time spent in growing even an average crop in reasonably large areas pays the highest wages of any farm work. If a farmer has a large area of crops, it not only indicates a good-sized business, but indicates that the farmer is doing a large amount of work that pays well.

Crop Yields.

Increased yield per acre is important, but not nearly so important as is usually assumed. Table 11 shows the relation of yield to labor income, when 100 per cent represents the average yield of the region.

TABLE 11. — *Relation of Crop Yields to Labor Income, 574 Farms.*

PERCENTAGE YIELD.	Average Percentage.	Number of Farms.	Labor Income.
75 or less,	67	58	$165
76 to 85,	81	60	219
86 to 95,	90	102	663
96 to 105,	101	116	570
106 to 115,	110	103	878
116 to 125,	120	66	951
Over 125,	138	69	1,090

An increased yield per acre makes the business larger, and if not carried too far is a good thing. After one secures yields of perhaps a fifth better than the neighbors *on the same soil* he must be careful that his cost per bushel for the increased crop is not more than the increase is worth. If the neighbors on the same soil get 1½ tons of hay per acre it may pay to grow 2 tons. If, under these conditions, one wishes 3 tons, it can usually be grown at less cost per ton on two acres than on one acre. This is the reason why the acres of crops have more influence on profits than does the yield per acre.

Production per Cow.

All dairy products are produced on a very close margin of profit. It is very easy to feed cows so as to lose all that one has made by raising crops. Table 12 shows the relation of receipts per cow to profits. Those farmers who get over $75 per cow are the only ones who are making good labor incomes. In this case $75 per cow indicates about 6,000 pounds of milk.

TABLE 12. — *Relation of Receipts per Cow to Profits, Tompkins County, N. Y.*

RECEIPTS PER COW.	Number of Farms.	Labor Income.
$30 or less, ...	18	$30
$31 to $50, ...	97	316
$51 to $75, ...	106	483
$76 to $100, ...	53	715
Over $100, ...	33	1,325

It will be seen that while farmers who get average crops are often doing very well, it takes much better than average cows to pay.

Diversity of Industry.

If a farmer raises nothing but crops he usually wastes considerable material that could be used to a profit to feed animals. If he raises animals only he spends all his time on the farm enterprise that is least likely to pay good wages. He does not get so much for his manure because a heavy application on one acre does not usually bring as good returns per ton as if spread on two acres. Nor is he so likely to keep horses and men fully employed. To care for a dozen cows is about half work for a man. One man can do this and raise the cows' feed and cash crops to sell besides. Table 13 shows such a comparison. The farmers who combine cash crops and stock make more than those who go to either extreme of specialization.

TABLE 13. — *Diversified Farming related to Profits on Farms selling Wholesale Market Milk, Livingston County, N. Y.*

PER CENT OF RECEIPTS FROM CROPS.	Number of Farms.	Average Area.	Labor Income.
15 or less, ...	14	209	$769
16 to 30, ...	28	218	1,210
31 to 50, ...	25	264	1,225

Table 14 shows that crop yields are less important than size of farm or production per cow. The combination of good cows and a large farm gives a better chance than good crops and good cows.

TABLE 14. — *Comparative Importance of Size, Crop Yields and Production per Cow, Jefferson County.*

	Labor Income.	Per Cent making Over $1,000 Labor Income.
All farms (670),	$609	22
97 farms (best crops, 132 per cent),	684	24
97 farms (best cows, $84+),	968	41
97 farms (largest, 224+ acres),	898	43
23 farms (best crops and cows),	994	39
11 farms (best cows and size),	1,294	73

As has been previously stated, there seems to be little relation between any of these factors. If a farmer is good in one respect it does not tell anything about the other points.

BALANCED FARMS.

Evidently a farmer who is as good as the average in every particular is very far from an average man. He is a very unusual man. In Jefferson County, out of 670 farmers, only 32 were as good as the average in each of the four respects. The average labor income of this region was $609, but the farmers who were as good as the average in size (143 acres or more), crop yields, receipts per cow ($59 or more) and in diversity (20 per cent or more from crops) made an average of $1,491, and only 6 of them failed to make as much as $1,000.

As a standard for dairy farms, we may take the average of all farmers in three regions who sold market milk and who made labor incomes of $2,000 or more. Table 15 gives these averages.

TABLE 15. — *Averages for 23 Farms selling Wholesale Market Milk (Three Counties).*

Acres,	257
Crop acres,	154
Crop index.	119
Receipts per cow (32 cows),	$98
Milk sold (pounds),	6,470
Per cent of receipts from crops,	34
Labor income,	$2,658

Our records give similar comparisons for other types of farming. But the principles of size and production hold on the truck farms and crop farms as well as on dairy farms.

INDIVIDUAL FARMS.

It is evident that we can give a very close estimate of labor income if we know the above four factors. The following examples are from Jefferson County: —

Farm 1.

Crop acres, 29; very poor.
Crop index, 208; excellent.
Receipts per cow (11 cows), $116; excellent.
Per cent of receipts from crops, 21; excellent.
Labor income, $980.

This is the best record for so small an area. It represents the top notch in the "little farm well tilled." Splendid crops, splendid cows, even on the small area, crops to sell, and all work done by the farmer himself with two months of hired labor. Such a farmer as this should be able to make $3,000 labor income if he rented land on which to grow 100 acres more of crops, doubled his number of cows, and kept two men by the year. With this system he would not have to work so hard.

Farm 2.

Crop acres, 21; very poor.
Crop index (hay, 3.3 tons; silage, 13 tons), 211; excellent.
Receipts per cow (8 cows), $90; excellent.
Per cent of receipts from crops, 22; excellent.
Hired labor, $250; poor for the size.
Labor income, $380.

This farmer kept poorer cows and hired one man, although he had so little work to do. For these reasons he made less than the owner of farm 1.

Farm 3.

Crop acres, 133; good.
Crop index (hay, 1.1 tons; oats, 25 bushels), 75; poor.
Receipts per cow (20 cows). $95; excellent.
Per cent of receipts from crops, 16; fair.
Labor income, $1,661.

This farmer gets crops only three-fourths as good as his neighbors, but with the large area he should make a good profit from growing them. He sells part, and what he feeds to cows he makes a second profit on because he gets such good returns per cow.

We should expect him to do very well indeed. His crops are only one-third as good as farms 1 and 2, but the larger area more than makes up. If the soil is as good as his neighbors he might readily bring his labor income to $2,000 by raising better crops.

Farm 4.

Crop acres, 110; excellent.
Crop index, 142; excellent.
Receipts per cow, $96; excellent.
Per cent of receipts from crops, 19; excellent.
Labor income, $2,239.

This farm is excellent in every particular. We should expect it to make at least $2,000, as it does. About the only difference from farm 3 is in crop yield.

Farm 5.

Crop acres, 109; excellent.
Crop index, 120; excellent.
Receipts per cow (32 cows), $56; poor.
Per cent of receipts from crops, 4; poor.
Labor income, minus $113.

This farmer made very good profit on his crops of which he had a good acreage. But he fed these crops to cows that did not pay their feed bill. If he had excellent cows his labor income would be $1,500, but as it is he did not even make interest on his capital. He paid for the privilege of working.

Farm 6.

Crop acres, 259; excellent.
Crop index, 134; excellent.
Receipts per cow (33 cows), $74; good.
Per cent of receipts from crops, 53; excellent.
Labor income, $3,270.

This is the highest labor income made by any farmer who sold milk at wholesale. With his unusually large area of good crops he could easily raise his labor income to $4,000 by keeping better cows.

After one has studied large numbers of records it becomes possible to tell whether the labor income is poor, good, fair or excellent by knowing these few figures. This is the final proof that these are the most important factors of profits; and it applies to other types of farming equally well. In about 5 cases out of 100 some other factor affects the results so decidedly as to make the guess wrong. But on most farms a good-sized area of crops and good yields have so strong an influence as to overshadow other factors, and almost insure good returns if the crops are sold or are fed to animals that bring good returns.

There are some city men in the audience. I may say that all this discussion is from results by practical farmers. City men are most likely to fail from putting too much money in buildings and keeping too many men, and from doing too many fancy things that are called scientific farming, but that are really "folly farming." Experienced farmers do not often make serious mistakes in these things.

A Farmer's Catechism.

Each farmer will do well to compare his farm with successful farms, to see where it is weak and whether it can be improved, by asking himself these questions: —

Have I 80 to 200 acres of crops? If not, can I buy or rent more land?

Are my crop yields 10 to 20 per cent better than my neighbors' who have the same soil? If not, will it not pay to improve them?

Are my cows at least 50 per cent better than my neighbors'? If not, how much am I losing on them per year? Had I best stop keeping cows, or get better ones?

Am I getting at least 20 per cent of my receipts from the sale of cash crops? If not, could I make more by raising cash crops?

Am I getting at least 20 per cent of my money from animal products? If not, am I making good use of low-grade farm products, and am I and my horses kept well employed most of the year?

QUESTION. Is that $11,000 you showed on the slide the actual capital, the equity?

Professor WARREN. No, it is the total capital, the value of the investment. The average mortgage, deducted from this, gives you what the farmer owns. The average is something like $2,000; still, it doesn't make a different figure. Suppose the farmer is in debt for all his capital, he would pay this interest; if he was in debt for none of it, he pays it to himself, you see.

QUESTION. (Following slide showing increased output per man, but not increased output per horse.) Isn't that due to improved machinery?

Professor WARREN. An improved driver and improved machinery, yes, but here is the thing: a lot of men here probably remember when you never cultivated anything with more than one horse, and now a lot of you use a two-horse cultivator and do almost twice as much per man. A good many can remember when you always plowed using two horses, and then you commenced to plow with three, and some with four, and the further west you get the more you find. The result is more crops raised per man, but the horse isn't doing any more. Even with four horses and one driver you won't get any more work than if you had two men driving two horses apiece, but the man is doing more. You find the same thing all the way through; take, for instance, the mowing machine. I know of a farm of which I happen to have photographs of three generations of mowing machines, — a 4-foot, 5-foot and an 8-foot, — and the 8-foot draws easier than any of the others, tires the horses less, also, because the 4-foot machine was built when the horses had to draw a mowing machine that went northeast when you went northwest. That is economy, — a straight improvement in machinery. So, all the way through farmers are getting to use more horsepower; and a horse, properly directed, is equal to ten men.

QUESTION. Are you willing to admit that on a good many farms it would require three horses to plow what two would do on another farm?

Professor WARREN. Certainly, certainly; but per man it holds just the same. If the driver is driving two on that farm, or three, and somebody else is driving one, he will plow more acres per man, but not any more per horse, ordinarily.

QUESTION. Can you compare the records of one man keeping 20 cows and selling cream, and another keeping 20 cows and selling milk?

Professor WARREN. I had those slides, but I left them in the hotel because I didn't want to mix this subject up. Market milk pays considerably better than any other dairy product. You have the same cost for dairying with market milk that you do with the other.

QUESTION. At what rate per quart?

Professor WARREN. At the rate we get in New York State in any county, and in Massachusetts it will be more emphatic, because you don't get for your butter proportionately more than you do for your milk. I am more in favor of market milk in this State than with us, because you make more on your milk than you do on your butter. You don't get any more than they do in Illinois for butter, unless you retail it.

Mr. R. H. RACE. I would like to know what is the practical application of this morning's address. Are we going to stay on the farm, or hire out for $60 a month?

Professor WARREN. You are not going to get into the $60 class, but unless you are going to make more than $60 you had better not stay on the farm, because you are worth more than that in the world. The practical application is to have enough acres so that you are going to get enough crops to keep your horses busy. Now, one-half of the farmers in America rent all their land; that is one way. Another way is, suppose you own some land and not enough, you can rent some of your neighbor; and one-fifth of the farmers in America do that. Another way: there are just lots of farmers, good farmers, who would be benefited, particularly if they are young men, if they would dare to go in debt and buy some land near them. Still another way is not to buy at first the land for farming, but to be a tenant long enough until you get money ahead. Be a hired man until you get money enough to buy a lame horse or two or three, and don't change too soon from a hired man to an owner. Be a tenant until you have got money enough to buy two or three acres of some man, and then you can buy that and rent some more; and you can do that little trick of throwing the hay over onto yours without taking the manure back, and that is usually done. [Laughter.] It isn't necessary to have all the money in the United States to get into farming that way. The man who has $2,000 can be a tenant on a big farm and do a big business and beat the men with a little patch all to pieces. Another way is, if you have got good enough land, to make the business pay on the same acreage by going into trucking; but don't all raise truck. There is enough produced in Massachusetts now to supply most of the people, and you know what happens to truck crop prices when you get too much. Don't do it unless you have got good land.

Now, about the cows. You have got to buy them because you don't raise them much in this State. You can't afford to feed 4-cent milk to calves unless you are fairly sure you will some day get the money back. You can raise some cows, but be critical; don't raise a calf merely because it is a heifer. Raise only the very cream of them.

Now, as to crops, you don't need to get a double crop yield. If you get 25 per cent better than your neighbor, you are going to do pretty well.

Those are the practical applications, it seems to me, and if you give me those figures, those four factors I spoke about, I can tell you, practically, how much money you will make, and perhaps tell you where the weak point is. Now, there isn't much satisfaction in going out and making that $2 a month on a farm just because some newspaper has said it is a good thing to get back to the land and hear the robins sing. There is no pleasure in hearing a robin sing when you are getting only $2 a month and your wages.

Mr. Potter. I don't quite understand what the method is of making comparisons between large and small farms. For instance, do you go along a road and pick out a good large farm and then go along and pick out a small one? It doesn't seem to me that you get a fair comparison between the large and the small.

Professor Warren. We take absolutely every farm in a section, and that is the only fair comparison. That is a question which we have to answer daily. We take absolutely every farm, good and bad, big and little, and have made the figures from all of them.

Mr. Potter. That is what I didn't understand. I thought you said 600 farms.

Professor Warren. Well, those are all within that region; those are all the farms operated by their owners. I didn't put the tenant farmers in that slide, because I didn't want to confuse you. We find, of course, great variations. But what is the limit? Why, to move up a step better, you don't need a million acres. A farm of 200 acres, with 100 in crops, or 300 acres with 150 acres in crops, is a good farm; but when you get down to less than 80 acres of crops you have got to figure some to find a fair profit.

Mr. Wilder. Did you find those figures all prepared, or did you have to do some preliminary work in getting them?

Professor Warren. We get them by asking the farmer all his sales. It takes about a quarter of a day to get them on each farm, on the average, and I feel that we get them with a great degree of accuracy because of the way in which we ask. If we ask a farmer what his receipts are, he doesn't know, but if we say, "How much did you get for your milk?" he is probably able to tell; then we check it up by going to the creamery and seeing if his method is accurate. If we ask him for his total expenses, he doesn't always know, but if I say, "How much did you spend for horseshoeing?" his wife will be right around there to jog his memory, you bet, and you will get pretty close to it. We say, "How much was your threshing bill?" and we get that, because he knows he had so many oats, and so forth, and he gives us the yield and we know there is so much oats, and at so much a bushel, and we get the threshing bill in that way, and so we can check it right straight along, and check up all the points, because we know most of these things. Then we have the cost accounts on a good many farms which help us. Then you can ask him his yield in hay and you can judge by the barn capacity whether he overestimated it or not. Then, you see, these conclusions are very sweeping. When a man gets $3 and another $3 and another $3, right straight through, and one fellow overestimates a couple of dollars on his horseshoeing bill, you see it doesn't make any great difference in the end.

Mr. Race. Now, the speaker discourages buying a farm and starting in with a small field, but a man hasn't any courage to work for a home on a hired farm. The farm should have a home value. Then he hasn't said anything about the boys who leave home, the best of them, who leave their fathers on the farms that aren't good enough for them to do farming on. I was talking with a big milk dealer in Port Chester, a suburb of New York, the other day, and he said he owned a farm in Egremont on which he had 30 cows, and he says to me, "I have sold the milk from those cows and I have got the money to show; it was $4,000 last season." He hired a man, a boss farmer. He doesn't do any work on his farm, but the boss farmer is working it, doing work for another man. He says to me, "I have got too big a farm. I have 130 acres and we have got to come to a smaller farm." Now, that is true; we have got to come to the smaller farm to get the boys that have gone away to come back to the farm. The boys want to go to the city where they get the salaries. We only produce 7 per cent more in this county than we consume all told; that is what the State Board of Agriculture put out, and we are getting down pretty close. If we should have a famine we should have to go to Russia to get something to eat. A fellow goes to the city and gets $60 or $70 a month, pays $30 for house rent, and all things, and where is his money? The cashier of a bank in Great Barrington said the other day something which I want to repeat to you. I said to him, "Who are your depositors in your bank? Who are the most reliable? Where does the most money come from that you can depend on? He says, "The farmers." "How about the business men?" And he says, "They overdraw their accounts every month."

Professor WARREN. Perhaps we had better turn it around the other way, about boys leaving the farm. We have studied this thing, and it isn't all hot air, as it is in the papers. We went to every farmhouse and said, "How many children have you?" We asked them, "What is each child doing?" We got the occupation of the daughters, the husbands, the sons, found what they were doing, and found that 82 per cent of the sons were staying on the larger farms of 200 acres and over. I don't remember the exact percentage on the small farms, but it was about 29 per cent. The sons will not stay on the small farms where there is nothing for them to do.

Mr. RACE. Then a man had better buy a farm right side of his and put the boy on it.

Professor WARREN. That is business. [Laughter and applause.] Suppose you have got 8 cows and 15 acres of hay and a little corn silage and a little oats and have got four sons and, of course, you aren't dead yet yourself —

Mr. RACE. Then I would have four farms right around there and work them between the four sons.

Professor WARREN. And *that* is business, too; and then you get your 200 acres. [Applause.] The little farm business is a question of whether you are going to starve to death or not. The crop yield per acre on the large farm is as good, or better, than on the small. Furthermore, on the small farm the horse eats up about all it earns, and there is nothing much left. The 200-acre farms are contributing much more per acre for human food as a surplus to sell than the small ones. If a horse cuts 5 acres of hay, he eats the whole thing up, pretty nearly, but when a horse is farming 30 acres of crops, perhaps 10 or 15 of that will be hay, — and it runs more than that in New England, — and then he doesn't eat it all. The yield per acre is better on the larger farms, or just as good, and since there are fewer horses per acre, they don't eat it all up, and the larger also contributes more to human food. Now, if you want to get to the bottom end of nowhere, just take, for example, Russia, or go further, to China, and see what they are doing there. Professor Gilmore, who has worked over there, says their greatest problem is the lack of men. They can't build railroads because every man has to work on the farm to keep himself. Each gets his little bit of a farm, and manages to scratch out a bare living for himself; he doesn't have anything to sell to feed the fellows who build the railroads. You have got to have a smaller and smaller percentage of our population on the soil, or civilization stops. With 100 per cent farmers we have no civilization; and the smaller the percentage of farmers, the higher the civilization. In America one man raises food enough to feed five families, while in China three men raise only enough to feed four families, and so they haven't men enough to build their railroads. They have got to open up Manchuria and get some farms big enough so that one man will raise enough to feed two or three, and until they can release men from those little truck patches they won't be building any railroads.

Oh, I had forgotten. There was that other question of Mr. Race's in regard to home value. The figures I am giving you are what the farmer gets for his labor. If he does not have any other source of income than the farm he must get a reasonable wage before he can have much of a home value there. The farmers who don't get more than $2 a day for wages, besides interest on their capital, are not living in a home that is very valuable, and the sons aren't impressed with the desirability of that sort of home. We have got to have a reasonable income, and your little farm doesn't give it. I showed you one of 11 acres, but that is a muck patch.

You can't get such results up on the granite hillside with 11 acres. I believe, though, that the little farm is going to do great things for the city worker; not the millionaire who has a big place, but the small worker in the factory. I believe we are going to get the factories out into the smaller towns, where the employees can live near the town and have truck patches; where they can earn a part of their support, and raise children and crops while at work in the factories. I believe most thoroughly in every city worker, who can, living on a farm. That is the home question. He has another source of income, and he doesn't have to sell anything from his farm. It makes a good place where he can bring up his children. But of course that isn't farming. Farming is taking land and out of that land creating enough money income so that you can educate your children, and so that you can have reading matter in your home, and music in your home if you want it. That takes a reasonable wage, and I have shown you this morning the four most important factors in making that reasonable wage. Farming is not a bad business; it is a good business if you like it and if you have got the thing organized on a reasonable basis.

Now, I have not tried to compare farming with city occupations. I have compared farming with farming to show how to make one farm pay as well as the next pays, whether either is good, bad or indifferent; that isn't the subject this morning. When you try to compare farming with city wages you have got a pretty complicated problem, which we have no time to discuss this morning.

Mr. Worth. Now, before any questions are asked, Mr. P. M. Harwood would like to make a statement while the gentlemen are all here.

"PROTECTION FROM FLIES" CONTEST.

MR. P. M. HARWOOD.

Yesterday I promised that if I could I would obtain from the office and read to you what we had written in relation to the "protection from flies" contest. Perhaps I ought to say, for the benefit of those who were not here yesterday, that the State of Massachusetts has offered sums of money not to exceed $5,000 per year for three consecutive years for the encouragement of dairying. Only one-fifth of what was asked for was granted us. We have aimed at two points: one, to encourage clean milk, — the production of clean milk in the pails before it is strained; therefore prizes were offered totaling $2,100 for milk which appeared to be the cleanest. We have also awarded prizes for dairies protected from flies. Now, if we can induce dairymen to be more cleanly in their methods of milking, keeping the dirt out and keeping the flies out, we think we have accomplished a good deal, and we think that a better way than penalizing people for not doing what they should do is to encourage them by giving prizes for doing better. Nothing has appealed to me since I came to this meeting as have the words of many of the unsuccessful contestants (114 being the total number, only 20 of whom could be successful), who have told me that they will try again if they have an opportunity; they say that they have learned more in this contest about the production of clean milk than they ever knew before in all their experience of years in dairying. This is encouraging.

I want to say just a word about taking advantage of the psychological moment. Mr. Kenneth E. Webb, winner of the second prize in the eastern section, was here yesterday and told our agent that he was receiving $100 more per month for his milk than he received before he won the prize. Immediately after the announcement of his winning that prize in a local paper he received 50 more applications than he could supply, and had to announce that he could take no more new customers. He has raised the price 1 cent per quart. Now, the lesson to be derived is that there may be like opportunity for all winners in this contest, and there are consumers who are ready and anxious to pay a fair price for clean milk, people who don't stop at 10, 12 or 15 cents a quart if they can be assured of clean milk such as these cottons show. Here is an opportunity for winners in these contests to get something out of it that is worth far more than the prizes; this, too, in addition to the educational feature which I have already mentioned.

In regard to the fly contest, we didn't have a large number of entries. We wish there had been more. These entries, like the others, were confined to practical dairymen. There were some very interesting entries. One farm which was visited during this contest appeared to be one of the best managed in Massachusetts, from the financial standpoint. It didn't fit in this contest because of the rules of scoring, but it exhibited the best "old-fashioned common sense" management on the part of its owner that I have seen in a long time. The principal products are cabbage, apples and potatoes. Milk is made, but merely to get manure to grow crops and to keep up and improve the fertility of the farm. That being the object, there isn't a particle of manure wasted. Three times a week, when the men go out to work after breakfast, one of them hitches up the teams while the others go into the barn cellar and throw some dry loam over the manure pile. The horse manure is treated in the same way except that it is also worked over by hogs.

There is little breeding of flies about the premises. Nothing appeared to be done in the way of trapping or screening to protect from flies, — perhaps it wasn't needed. The barn cellar containing 100 loads of manure was so well cared for and so well ventilated that nothing disagreeable is brought to one's attention. Here is a man who when he bought that farm went into debt for every dollar of its cost and worked out of debt by well-managed farm operations. I hope some day we will have money enough so that we can award prizes for the best managed dairy farms.

In this contest, the following score card was used: —

	Points.
1. Means adopted to prevent fly breeding, including the treatment and disposal of manure, refuse, etc.,	25
2. Thoroughness of screening, shading, etc.,	15
3. Best methods of trapping, spraying, etc.,	10
4. General effectiveness of the whole scheme.	50
Total,	100

This method of scoring, placing special emphasis upon the prevention of fly breeding, was adopted because it was believed that such prevention is of primary importance. If no flies are bred there are none to screen or trap, and much annoyance and expense is avoided.

EXTRACT FROM REPORT OF JUDGE, MR. E. H. FORBUSH.

The first prize, of $100, is awarded to Miss Helen Holmes, Kingston, Mass., on a score of 95 points. The methods of fly prevention adopted by her are as follows: —

Her stable is a modern one, with cement floors and gutters. It is washed down with a hose in summer and swept out and sprinkled with ground plaster in winter. The cement troughs in which the feeding is done are flushed out after each feeding. The walls and ceilings are painted twice each year with cold water paint. The manure is removed twice daily and placed in a pit. The horse manure particularly is treated daily with acid phosphate and kainite in equal parts, approximately two pounds per horse, to prevent fly breeding. In the cow stable cheese-cloth screens are placed in the windows on the north side. On the south side there are shutters left open at the top to allow the flies to escape. There are green cambric shades in the horse stable, so arranged that they flap outward to allow flies to escape. Miss Holmes says that her horses are never disturbed by flies in the stable. "Humane Fly Killer" and fly poison are sprinkled on floors and used in dishes in the windows. Fly papers are put up in the milk room. Home-made fly traps of the Hodge pattern are used in the barn. Cream cheese and molasses have proved to be the best baits in the traps. Cows are sprayed before being turned out to pasture and when they come into the barn at night. Only four flies were found in the milk room, which was open at the time it was inspected. The cow stable was very neat and contained but ten flies. Garbage cans about the premises were kept closed and treated with lime when washed. The privy contained a vault tightly closed.

The second prize, of $90, is awarded to Mr. C. Herbert Poore, Bradford, on a score of 93 points. His is a modern stable, and both stable and milk room are carefully screened. There is a shed for the manure where wagon or manure spreader is kept, and the manure is hauled out and spread twice daily. A heavy curtain hangs in front of the manure shed to darken it, and a large fly trap is placed on top of the shed, so that the flies which come in quickly seek the opening above and go into the trap. This method and the frequent carting out of manure is intended to prevent the breeding of flies. Everything is properly whitewashed, and many sheets of fly paper are used in the milk room. Milk is bottled by machine and nine flies only were seen in the milk room and in the ice box, where it was so cold they were practically quiescent and harmless. The wash room was not darkened. There was no privy, there being a water-closet in the house.

The third prize, of $80, is awarded to Mr. L. W. Newton, Southborough, on a score of 91 points. His stable is a lean-to to the barn, with cement floors and well whitewashed. Horses are kept near by, but with a closed door between the horse stable and the cow stable. The cows are sprayed with "Cow Ease." The fly killer is used to kill flies daily. All windows are perfectly screened, and the stable is tight enough to exclude flies. Fewer flies were seen in this stable than in any other. The manure is thrown into the barn cellar and horse manure is covered with cow manure. The cows are brushed off daily as they come through the door. Twenty sheets of fly paper are laid in the windows. Only three flies were found in the milk room. The stable is small and but few cows are kept, but all are exceedingly well cared for. Water-closet in the house.

The fourth prize, of $70, is awarded to Mr. Henry Ferguson, Westborough, on a score of 88 points. His is an old wooden barn with a large cellar. Manure is thrown into the cellar, which is dark and cool. The stable is whitewashed and well screened. There are small cellar windows around the cellar, but those directly over the manure are screened, and flies did not seem to come in through the others. There were few flies in the stable and none at all in the milk room, which was screened and somewhat shaded. Two visits were made to this place and no flies were seen in the milk room although there were flies outside. The cows were sprayed daily with a disinfectant manufactured locally. The same disinfectant was sprinkled around the floor of the milk room and may have driven the flies out.

The stable and milk room were screened. Chloride of lime and ashes were used in the privy.

The fifth prize, of $60, is awarded to Mr. Agostino Visocchi, North Sudbury, on a score of 80 points. Here was found a good, clean, well-constructed stable, with cement floors built on plans of his own. Leather strings were attached to the top of the door frame for the purpose of brushing the flies off the cows' backs as they entered the stable. There were but few flies in the stable. The windows were fully screened everywhere. Twenty-three fly papers, twenty-eight small fly traps and ten large ones were distributed about the stable. He keeps forty-three cows. The milk room was well screened and clean and also well supplied with fly traps. There were less than a dozen flies in the milk room. The horses are kept in a separate stable. The manure is not treated, but a pit is being made to receive it. No one had taken more pains to exclude flies than this Italian farmer, but he has not yet prevented fly breeding.

The sixth prize, of $50, is awarded to Mr. Jose Pontes, Swansea, on the score of 76 points. He has a wooden barn or cattle stable, which was found well cleaned, and sprayed with lime and salt frequently. The cows are sprayed daily with cattle oil. Manure is stored in the barn cellar altogether. No signs of fly breeding. The heap was frequently sprayed with lime[1] and salt and covered with a mixture of cotton and wool waste from neighboring mills. Spray was made by taking lime and water and putting in a considerable quantity of salt, which was used with a spraying machine as whitewash. No fly traps were used. The milk room was screened. There were but few flies in the stable and none in the milk room.

The scores of the other contestants were 69, 66, 62, 60, 54, 52, 49, 36, 25 and 15.

It appears from the above report that fly breeding may be to a considerable extent prevented by properly caring for horse manure and the contents of privies,[2] in which a large per cent of the flies appearing about farm buildings are bred, by either hauling away each day or applying daily a mixture of acid phosphate and kainite, or covering with dry earth, and also by thoroughly caring for whatever garbage and other advantageous places for breeding there may be about the premises. A proper system of shading, that is, darkening rooms when not in use, as well as proper screening, go a long way towards keeping flies out of the stable and milk room. The judicious use of fly paper, traps, sprays, etc., aids materially in reducing the number of flies after they have appeared. The greatest effort, however, should be made to prevent fly breeding, and this should be done by using such means as are effectual, and at the same time do not injure the fertilizing properties of the manure.

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[1] Lime is not advocated in this connection because, in contact with manure, it liberates ammonia, thus causing economic loss.

[2] Privy vaults should be tight and fly proof.

We believe there is yet much to be learned in regard to the means of preventing fly breeding, and it is hoped that this contest and others that may follow will be useful in developing still better methods and devices.

Nature has apparently provided flies as the natural accompaniment of certain more or less disagreeable and unsanitary conditions. Remove these conditions and the necessity for flies no longer remains.

Mr. Worth. We will now adjourn until 2 o'clock, when there will be a lecture in this hall by Mr. F. E. Duffy of West Hartford, Conn., on "Breeding and Feeding Dairy Cattle."

Afternoon Session.

The afternoon session was called to order at 2.15 by Secretary Wheeler, who introduced as chairman for the afternoon, Mr. B. W. Potter of Worcester.

Mr. Potter briefly referred to the morning's debate as follows: —

ADDRESS OF MR. BURTON W. POTTER.

We had a good lesson this morning, and it seems to me that the essence of Professor Warren's contention is not the superiority of the large farm over the small farm, but the superiority of diversified farming over specialized farming. That was the lesson that forced itself upon me the most. I am a dairyman and I have long wondered what was the reason that my profits are so small, but I am beginning to think that it is because I don't raise enough other crops. I don't consider myself entirely responsible for that, because professors and experts for twenty-five or thirty years past have come to these meetings and told us that we were to specialize more in our work. They said if we were going to raise peaches, we must not raise apples; and if we were going into dairying, we must do dairying and nothing else. We have followed that for a good long while, and now we are beginning to find out that perhaps we are on the wrong track, after all, and maybe would do better to go back and raise more diversified products. In farming, everything depends upon management. The first time I ever heard Dean Cook speak was on this same subject at Lowell, and he said everything depended tremendously on management; that even witch-grass on a farm, if it was rightly managed, was a valuable asset; and I say, if that is so, then my farm is more valuable than I ever thought it was. [Laughter.] He also said in that address that the chief product of the dairy cow was the manure; her milk was to buy fodder.

Now, we are going to have this afternoon an address from Mr. Duffy of Connecticut, and I suspect that perhaps he is a trust magnate, because last night I heard him say at the dairyman's meeting that he sold his cream for 96 cents a quart. Now, I think I myself am doing pretty well, and my conscience troubles me some, because I have been selling mine for 60 cents a quart. If a man can sell it at 96 cents, he surely must have some pull somewhere. [Laughter.] We have in law what we call the "Corporation Sole," and I imagine that Mr. Duffy, perhaps, is a dairy farmer sole, because I don't believe many people in Massachusetts or Connecticut can realize 96 cents a quart on their cream. If he can tell us how to do it, he has mastered the selling end which we would all like to know something about. Without detaining you further I will introduce Mr. F. E. Duffy of West Hartford, Conn., who will speak on "Breeding and Feeding Dairy Cattle."

BREEDING AND FEEDING DAIRY CATTLE.

MR. F. E. DUFFY, WEST HARTFORD, CONN.

May the day soon come when no man who does not love the dairy cow shall feed or breed her. I use the word "love" advisedly. The good breeder to my mind is the one who joys to minister to her wants, delights in her presence during his waking hours, goes to his rest to dream of a more perfect dairy type of his breed yet to be, and if he is a praying man, the prayer of his heart will be that the dairy cow which he breeds may more nearly approximate perfection.

I say that every breeder of dairy cattle should love his particular breed and should recognize it as his life work to perfect the type or ideal of that breed. May his love be as great and his discretion greater than that of an old Scotchman whom I once knew, who was never profane unless the transcendent qualities of his well loved "Ayrshire coos" were called in question. He declared that when a man in Scotland rented land, if he was wise in agriculture he would buy a "bunch" of "Ayrshire coos," and if he breeds them "well for a ten year" he could pay for his farm; and if he keeps the increase "well for five year more" he could buy his neighbor's farm; and if he learned his business and "tended his coos well until he was fifty year old" he could buy every farm that joined him.

How much of this description was born of the Scotchman's enthusiasm I must leave you to judge. But this I know, that on a beautiful May day in the 90's I was present at a sale of his dairy cattle, and the best breeders of Ayrshires in the country had traveled many a weary mile to this farm in the back country at Hemmingford, Quebec. The farm was six miles from a railroad, and yet this herd was sold to these breeders for three times the amount that Mr. Clellan was able to get for his farm. I have cited this instance, and I might cite numberless like ones, as a proof of a position that I am about to take that is not eagerly assented to in New England. It is this: that breeding registered dairy cattle of any of the four dairy breeds is the most profitable kind of dairying for 90 per cent of the people engaged in the dairy industry in New England. I except the men who make market milk and who live in close proximity to our cities. But I am inclined to the opinion that even they might be included and the truth of the proposition still be verified. In attempting to substantiate this statement I shall try to cover the whole scope of my subject. Whether I will or no I must invite the young men of the rural communities to engage in breeding and feeding the dairy cow.

Is it worth while? Is there anything in this constant babbling about back to the land and keeping the young people on the farm? Something, perhaps; but its importance has been greatly exaggerated. There are enough agricultural products, and especially dairy products, produced already to meet every reasonable demand. In the beginning this country was populated practically by farmers alone, but as inventions have aided the farmer he has been able to dispense with much manual labor, until to-day 60 per cent of the population dwell in the cities and only 40 per cent on the farm. As inventions continue to multiply, and they certainly will, less and less people proportionally will be required on the farm.

This is as it should be. What needs to be remedied is extortionate transportation charges and the excessive costs of distribution. The city papers should teach their readers that the agricultural industry is the only industry in this country that is on a strictly competitive basis. Farming is the only industry in the country that welcomes every comer to its ranks, the city editor included, and furnishes them with all the instruction at its command to compete with us and to help lower the cost of our products. If the "back to the land" propaganda could be carried out it would bring about another agricultural depression in prices and another exodus of country people to the cities; and so on *ad infinitum*. I do not believe we are in any great danger of such a repetition of history. American lands are nearly developed, and the population of our cities will continue to increase much faster than the farming population. Furthermore, whether or no agriculture is to become a profession, it is rapidly being divided into distinct branches, and each branch to be carried on effectively requires a high degree of intelligence and skill. As the years go by the intelligence and training given by the schools and the skill obtained by practice will receive greater and greater rewards.

Herein is your opportunity, young man. You will be paid according to the intelligence, training and skill you acquire in breeding and feeding dairy cattle, and if you possess these attributes in a high degree your reward will compare favorably to that to be had in any other industry.

But you say: What about the teachings of our "modern" agricultural papers, that are so glibly reciting that success can be insured by using a few well-meant recipes of how to conduct a farm according to the rules of scientific agriculture as laid down in their columns? I have this to say about their teachings, that they are mostly prepared by newspaper reporters out of a job. Their reports of profits of men who merely take up agriculture as a pastime are truly wonderful. These reports and their wonderful figures bring to mind the dictum of Carroll D. Wright: "While figures will not lie, liars will figure." Nor is this type of agricultural paper the only agency that is deceiving the people in this respect. This country is spending large sums of money collecting statistics that remind one of D'Israeli's saying that "There are lies, damn lies, and statistics." We have also officials in this country who from these figures draw equally unusual conclusions. A very distinguished official recently "demonstrated" by such figures that in the course of the advance in prices in this country the farmer had reaped a reward out of all proportion to that of the man engaged in any other industry. To prove his statement he cited the profits of raising corn. He stated that the value of an acre of corn, including forage, was $16, and proved by his figures that 25 per cent of this was net profit, leaving $12 as the expense of raising the crop. Now it is a fact that an acre of corn of the weights given by him depletes the soil of $12 worth of fertility.

I have taken so much of your time to correct the common error of to-day in many quarters in underestimating the importance, and the possible profits, of the breeding of dairy cattle. The breeding of registered dairy cattle, if done skillfully and intelligently, is the most profitable kind of dairy husbandry. It is a business requiring skill and intelligence of that order that is possessed by the New England farm boy who has learned how to do well every task on one of these little four or five cow hill farms. I would have him possess a good common school education in addition to his farm education, and besides that all the higher education he can get, providing it can be done in a reasonable time and does not estrange him from the cow and her care. Every breeder should read the agricultural papers, especially the dairy press, and without fail he must study the breed paper of his dairy breed. He should get in as close touch as possible with the agricultural college in his State. The best dairy man that I have ever known received his inspiration for work from a six weeks' course in dairying. He should be a member of the Dairymen's Association of his State, also of the Jersey, Holstein, Guernsey or Ayrshire associations.

I would recommend VanPelt's "Cow Demonstration" for a handbook, and Davenport's "Principles of Breeding" for a textbook, on breeding. He should also spend an hour each day reading the best English authors on breeding dairy cattle. He must possess skill in judging the dairy cow, and to get it should see and study every great dairy cow of his breed within one hundred miles of his home. He must know his score card and be able to see the fault or merit of each particular organ. That such a life work is a delightful one all may admit; but what about the fellow who says it won't pay? It is paying on tens of thousands of dairy farms in America to-day.

It pays even if only the increased value of the dairy product is considered. In my own experience in breeding in eight years I was enabled to increase the dairy product of my herd 33⅓ per cent, and to increase the price of that product as well. One breeder in Connecticut has sold $10,000 worth of stock during the last year from a farm of 150 acres. Now, my boy, if you go at this business right and select a good woman as your partner (using the greatest precaution in her selection, for you will never make a more important one), you may be assured of a just return for your labor. The New England dairymen who are raising registered cattle as a part of their dairy enterprise are the only dairymen in New England that are receiving the profit that they should from their business.

If a young man and his wise counsellor are about to make their first investment in registered dairy stock, how shall it be done? If the education that I have outlined has been neglected, then they are poorly equipped for this task. The prime requisite in a breeding herd is a good bull; and great bulls are sons of great mothers. So the buyer must know the mother, and if possible the grand dams; and much care should be given in studying these matrons. Skill in selecting good dairy cows can be acquired by any New England boy of a good common school education who will put his best energies into the work. Selection of the bull is the greatest factor in building up the dairy herd; but the judging of the dam of the bull must precede the examination of the bull himself.

The best method of studying the dairy cow is to study the cow herself. Get a thorough understanding of the score card; get a course in an agricultural college if possible; get all the help you can from dairy papers, bulletins and books on breeding; but with all your getting, get a thorough knowledge of that particular cow. Study a good cow at every opportunity, and if the opportunity does not present itself often enough, make opportunities by visiting the best herds in the country. This must be field work. Any discussion of the subject can only be suggestive.

This afternoon we will briefly touch upon five points: the indications of constitution, of capacity, of nervous temperament, of blood circulation and of ability to produce. Constitution is indicated by the large open nostril, large windpipe, depth from the top of the shoulder to the floor of the chest, and breadth of chest. These indications must be possessed by the cows close up in our bull's pedigree if he is to be the progenitor of a great herd of dairy animals. The mother of our bull, and the grandmothers as well, must have capacity to digest large quantities of food without destroying their future usefulness. It is not enough to know that these cows have done a good year's work, but that they are able to repeat the performance for a period of years. She should have a large mouth, and, what is of equal importance, width, depth and strength of jaw. She should have a long, broad, deep barrel, though length is not of as great importance as breadth and depth. She should have broad, flat, well-sprung ribs; but more important than these is that indefinable thing that judges call quality; and here, the eye failing, the judge of the dairy cow must determine by the feel of the texture of the hide and hair whether the cow has strength and efficiency to properly digest her food.

The cow must have a strong nervous temperament also if she is to digest her food well and secrete the milk necessary to make her a profitable animal. The large, bright, prominent, placid eye, and the intelligent expression indicate this type of nervous temperament. The spinal processes should be open and free from fat, not large but sharp and clean cut. The hips and ribs should also be free from fat, sharp and well defined. This matter of nervous temperament must not be slighted. Sit around and watch her for a half an hour if you are thinking of buying her. See that she is ever at her work and is not easily disturbed.

The mammary veins and milk wells are the best indications of a strong circulation. The veins should be long, large and as tortuous as may be. If they enter the abdomen through many milk wells so much the better. The milk wells should be large and clean cut. Study well also the udder and its attachment. Insist on the large, broad, spherical udder running way to the front and attached high in the rear and level on the bottom. Avoid the pendant and tilted udders. The thigh must be thin and incurving, to give room for that breadth of udder so necessary to secure the requisite size. You should see the cow milked to make sure that the udder is entirely free from hard fatty tissue, and that the quality and texture is all that is to be desired. In brief, the udder should be uniform and symmetrical, spherical, and the quarters smoothly joined, with four easily milked teats of good size. Do not forget to demand the size, and remember that the udder cannot be attached too high in the rear, have too great breadth, or run too far to the front. If the mother of the bull possesses all these qualities in a marked degree she should be a comely matron; and if she has grace and beauty she is worthy to be the mother of our bull. Possibly we might excuse the grand dams if they were only fairly good in some of these points, but any marked weakness in any one of them should be sufficient to cause us to reject the bull himself and look further for our dairy sire.

The pedigree of the bull being satisfactory, what shall we demand of the animal himself? He should possess the refinement and form of the dairy cow as far as is consistent with a strong masculinity, but do not let us confuse ugliness or beefiness with masculinity. He should have all the indications of constitution, capacity, strong nervous temperament, well-marked mammary veins and milk wells, with as large and well-placed rudimentaries as it is possible to get. He should possess majesty, beauty, power and be every inch a king. I have not mentioned the sire and grandsires, because I should be inclined to greater leniency in judging them than in judging the cows. But I should require of them the same general type sought for in my dairy sire.

Having selected my herd bull, I would next look for the females to mate with him. I would, if possible, select two or more registered cows or heifers, animals possessing constitution, capacity, nervous temperament, and the indications of circulation and ability even if heifers, for these qualities are stamped on the calf if possessed in a strong degree. And above all things see to it that your heifers or cows are sired by a great bull, as the daughters of a sire inherit his excellencies or defects with almost unfailing accuracy. If my capital were limited (and the breeders on small farms whom

I am most interested in will have a small capital to commence on) I would secure ten, twenty or thirty good grades of big capacity and ability, with all the other points of excellence that grades can be found to possess. I would keep ten or twenty cows, and so on, increasing by tens, as these are the numbers that one or two or more men can economically care for. Having selected or retained a herd of cattle (for many times it is much better to retain grades of known profitable production rather than to risk the hazards of purchase) it is now necessary to consider from a broader standpoint how to establish a registered herd of the best quality.

We must remember that a great producing animal is the product of the three factors of wise selection, good environment and skillful feeding. It is folly to attempt to breed a great herd of cattle without a good cow home to put them in. Sunlight and pure air are as free as the grace of God, and they are necessary to the uplift of the bovine family. The laws of Connecticut, and I doubt not of Massachusetts, are stringent in requiring the access of light and also as to providing good ventilation, but in Connecticut the laws to secure ventilation are not so well worked out. But if our herd is to be healthy and productive our stable must be well ventilated and free from odors. The King system of ventilation is best. It is simple, cheap and can be put into any stable. Muslin ventilation comes next. Every stable should be as well lighted as the living room of the family.

The old farm stable can be made comfortable and sanitary, but if we have skillfully selected our herd it will pay for a better one as the years pass. The good dairy cow should be well fed from the day she is born until she has finished her life work. I leave the calf with the cow for five days, until the mother's milk is fit for use. I then give 1 quart of milk, diluted with 1 pint of water, three times daily for five more days, and then feed 2 quarts of milk so diluted morning and evening for three weeks; and during the next week skim milk is substituted for the whole milk. For the first three or four feeds I sweeten the milk with 2 tablespoonfuls of granulated sugar, so that the calf may more readily learn to drink. The calf should be given grain and hay as soon as it will take them, and should have all it will take of these until it is a year old. The hay should be rowen or early cut fine hay, preferably clover, or alfalfa after the calf is six months old. For the next six months the heifer should consume a large quantity of good hay and 4 pounds of grain per day, if not on excellent pasture. There are many excellent mixtures of grain. We are using a mixture of cornmeal and bran, each one part, and dry grains, two parts, for feeding our young stock.

If bred to freshen, at two years of age, the heifer should have an increase of grain after she is eighteen months old. I gradually increase the grain from 4 to 8 pounds up to ten days before calving. If there is any sign of caked udder or fever I give a pound of Epsom salts three or four days before calving. I use the same treatment for cows about to calve.

Remember that the heifer carrying her first calf should have all the feed she needs, and of a highly nitrogenous nature. For this reason I would use silage only once a day, but would prefer beet pulp or roots. The hay should be clover or alfalfa if obtainable, but if not, early cut, fine hay should be fed a growing heifer, calf or dairy cow. The quality of a dairyman or breeder may be very accurately rated by the quality of the hay that he feeds.

Hay for a dairy herd should be stored by July 10, and preferably by July 4. Hay stored later should only be used to feed horses or oxen. I hesitate to discuss the feeding of the milch cow, as in our State, at least, there seems to be such a wide belief in a few simple glib rules that do work fairly well, and if taken at their true value would really be of considerable aid in feeding. A cow in my opinion can no more be fed by rule than can a man. The balanced ration, the number of pounds of grain to the number of pounds of milk, when, and how to feed, all are matters that admit of such variations as the skillful feeder only can apply. I shall offer no dairy rations, but I shall say that the feeder who cannot prepare a balanced ration at a moment's notice is ill fitted for his work, and furthermore the feeder who will not change the composition of the ration as the cow indicates the need of a change, by putting on flesh or losing flesh, has not acquired that skill in feeding that might be his for a reasonable effort. In a word, learn all the rules of feeding you may, but always test them out on the cow. If the evidence given by the cow contradicts the rule, believe the cow, every time. The skilled eye and hand of the successful breeder and feeder is the thing to be sought, with sufficient knowledge of the nutrients as an aid in the selection of feeds. One point on which all skillful feeders will agree is that the value in feeding of a good quality of coarse forage cannot be overestimated. Grain cannot take the place of early cut, well cured alfalfa, clover, or rowen hay, and the quality and curing of silage is of almost as much importance; while roots, especially beets, tone up the digestive organs to do their most effective work.

My experience is that the narrow ration is the more efficient, but an easily digested carbohydrate is added frequently, and if good results are obtained it is retained for a few weeks and then withdrawn and the consequences watched. During extreme cold weather a quart of hominy or cornmeal can be added to advantage and then dropped when the weather moderates. The hair and hide of the cow are the first index of overfeeding. The skillful feeder notes his cow and prevents a breakdown. Henry, on "Feeds and Feeding," should be the feeder's textbook, and he should read the best dairy papers.

If our young breeder will care for his registered bull and females, study their needs and retain their increase, adding to them another heifer or two as he is able; will study and reflect on their care, and, as Josh Billings has said, emulate the merits of a postage stamp in sticking to one thing, he will live to bless the day that he began to breed registered dairy cattle.

Mr. F. A. Judith. I would like to ask if a dairyman can afford to pay $27 a ton for alfalfa when he can buy fair mixed hay for $20.

Mr. Duffy. Well, that depends on what you call fair mixed hay. Was it cut by the 20th of June?

Mr. Judith. Yes. Our hay is cut in good season; that is, it is cut along the latter part of June, perhaps the middle to the latter part. It consists of clover, timothy and red top.

Mr. Duffy. Well, now, that of course would depend altogether on the quality of the hay, and I wouldn't want to say offhand I wouldn't buy it, but I actually believe from my experience to-day that if I had some corking good cows I could afford to buy the alfalfa. I still believe that I have stood in my own light when I would not buy beet pulp and sell timothy. I had one of the best fields of clover two years ago I ever raised, and for some unknown reason it was filled with alsike, but I have taken it out and am feeding alfalfa, and I know I am doing the right thing and I am getting big returns. I wouldn't dare to feed that hay.

Now, about ten days after we got through haying at my farm, a friend of mine invited me down to Storrs. It was around the 25th of July; we went from Hartford in an automobile to Storrs, and I was perfectly astounded to see the dairymen along the road putting in hay to feed their dairy cattle. Why, they couldn't expect to succeed. They have no right to succeed and don't succeed.

Now, people say dairying doesn't pay, and they are trying to find out what is the reason. Well, there are men who are making dairying pay, even at the prices for market milk in Boston and Hartford; men are making money producing milk of that kind; but there are also others who are not. The men who are making the money are the men who are working along the right line, in that and every special line of agriculture. In Connecticut they are making money, but they know how to do the thing and do it right, and the fellow who is kicking and says he can't make it pay has got to think it over and change his method.

Mr. Lee. I would like to ask about beet pulp. Do you shorten your grain ration? Do you feed the pulp wet?

Mr. Duffy. Feed it wet, and do not shorten the grain ration very much.

Mr. Lee. It is rather expensive, but mighty good.

Mr. Duffy. When you get $400 or $500 worth of milk by feeding it, what do you care? If you can increase your yield, what difference does it make?

Mr. Lee. That is true.

Mr. Duffy. I don't believe that makes any difference so long as you can increase the product for the average cow from 15 to 25 per cent, if you have got the right kind of cow.

Question. How much beet pulp do you feed in a day?

Mr. Duffy. Not over 5 or 6 pounds, and when you begin to feed silage, not over 3 or 4.

Professor Brooks. Mr. Chairman, I want to emphasize, if I may, what the speaker has said concerning the importance of good, fine, mixed hay, like clover. Many of you have been on the grounds of the Agricultural College in Amherst. We have about 30 acres, which is really part of our campus. We do not like to break it up on account of its proximity to the college buildings, so it has been kept permanently in grass, without being plowed, for about thirty years. It is top dressed with fertilizer and does admirably. The prevailing species are Kentucky blue grass, white clover, red clover, fescue and some orchard grass, no doubt a little timothy. That land produces usually about 2 tons of hay to the acre. We mean to cut it every year before Commencement, which is about the 20th of June. In successful seasons, favorable seasons, that is, with well-distributed and sufficient rains, the white clover is sometimes at the level of my knees. I have never seen so tall and so luxuriant white clover elsewhere.

Now, we have had a good deal of experience in feeding this hay to dairy cows, in comparison with other hays, not excepting alfalfa, and Mr. Forestall, whom many of you know, and who is a good judge of dairy cows and a good feeder, told me that whenever he changed from alfalfa to the hay from these old mowings, he noted an increase in the milk; and Dr. Ramsey, whom many of you know by reputation, has told me more than once that he would get about 3 pints of milk per cow more when feeding this hay than when feeding an ordinary mixture of timothy, red top and clover. I don't wish anything that I say to influence any of you against growing alfalfa. It is a splendid crop, which we ought to grow wherever we can, but we should not forget that our own familiar grasses and white clover and alsike clover will give us a splendid hay which will compare very favorably with the very best of alfalfa. [Applause.]

QUESTION. I would like to ask Professor Brooks what fertilizer he puts on this land.

Professor BROOKS. A mixture of basic slag and sulphate of potash, about 500 pounds to the acre of the slag meal and 150 of high-grade sulphate of potash. On some parts of the mowing, in place of the high-grade sulphate, we have used low-grade sulphate on the top, 300 pounds to the acre; and in other parts, in addition to the slag meal and potash, we are using nitrate of soda in varying quantities, from 150 pounds to the acre, on some portions, to 250 pounds on others. With slag and potash in the quantities which I have indicated, and adding about 150 pounds of the nitrate of soda, we get a splendid crop with a large proportion of clover.

EVENING SESSION.

The evening session was called to order by Secretary Wheeler at 7.15 P.M., and he introduced as the chairman of the evening, Mr. John Bursley. Mr. Bursley, after a brief reference to the long and effective services of ex-Secretary J. Lewis Ellsworth to the agricultural interests of the State, called upon ex-Secretary Ellsworth for an address on "Rural Credit and Co-operation in Europe."

RURAL CREDIT, BANKING AND AGRICULTURAL CO-OPERATION IN EUROPE.

J. LEWIS ELLSWORTH.

The commission to which I was a delegate was a national commission directed to study the systems of rural credit and agricultural co-operation existing in Europe.

It consisted of 78 members; 7 were appointed by the President, 65 were appointed by the Governors of different States and by a few interested organizations, and 6 represented Canada. The delegation from Massachusetts consisted of Pres. Kenyon L. Butterfield of the Agricultural College, appointed by President Wilson, and Mrs. Charlotte B. Ware and myself, appointed by Governor Foss. The Southern Commercial Congress initiated this movement for an organized study of the systems of co-operation and rural credit in European countries, recognizing the need of such facilities in this country if our agriculture is to prosper. European countries were long since forced to face these problems and have made great strides in this direction. To them, then, the American commission turned to ascertain how their methods and organizations could be made to assist in developing a more profitable agriculture and better country life conditions here in the United States. We here in America are apt to think of the inhabitants of the European countries as rather decadent, both physically and mentally. This we found to be far from the fact, as everywhere the Italians, Germans or Danes, as the case might be, were splendid men, strong and intelligent, making a very evident success of agriculture and utilizing every bit of land that could be made available. Not only were they profiting by their systems of co-operation and rural credit, but they seemed to have a thorough knowledge of the general principles and the details of growing their crops and breeding their horses, cattle, sheep and hogs.

While in every country and at every stop, the commission gathered much of interest and much valuable information, the time at my disposal forbids even a hurried discussion of conditions in all of these different countries. I shall, then, simply endeavor to explain the two systems of rural credit which seem most successful and most applicable to our conditions, — the systems now operative in Germany, — and then give you an insight into the methods and results of business co-operation among the farmers of Germany, Denmark and Holland, with a brief reference to conditions in Austria-Hungary and France, in which five countries, and especially in the first three, both the systems of co-operative credit and co-operative business seemed to have been more fully developed than elsewhere.

RURAL CREDIT.

The rural credit systems of Germany have to do with two distinct and necessary forms of credit, — the short-term or personal loan, and the long-term, which is usually the land-mortgage loan. In regard to the personal or short-term loan we found two distinct systems in Germany, — one serving the urban districts, the other operative in rural territory. These are the Schultze-Delitsche system, which usually operates in cities and towns and is not strictly a local institution, and the Raiffeisen system, which confines its activities to local rural districts. Our interest centers in the latter type, and I shall therefore not attempt to describe the former, but shall confine my observations to the Raiffeisen loan associations.

Raiffeisen Loan Associations.

Their founder, Friedrich Wilhelm Raiffeisen, was born of very poor parents in 1818. Although his education was very meager he developed a deep interest in his fellow countrymen which prompted him to make an effort to relieve them from oppression by usurers and "loan sharks," and evolve a scheme whereby they might secure funds at a reasonable rate of interest. The result of his efforts was the establishment of the so-called "Raiffeisen banks," which have since proved such a blessing to the lower classes in Germany. Before his death these banks had become very numerous. The memory of "Father Raiffeisen," as he is known among the German people, is one of their choicest possessions.

Briefly, the principles upon which the Raiffeisen banks are founded are as follows: —

(*a*) Unlimited liability of all members as security.

(*b*) Permanent reserve fund as additional security.

(*c*) Limitation of area, insuring personal acquaintance of all members, and none may belong to more than one society at one time.

(*d*) Loans are made only for productive or provident purposes and only to members; investigation made first as to the purpose and then as to the actual use of the loan; maximum time of loan five years.

(*e*) Facilities for repayment by installments; borrower also at liberty to cancel full debt by payment at any time.

(*f*) Absence of profit seeking, dividends being limited to rate of interest paid by borrower, if any are declared.

(*g*) Office holders, with single exception of secretary or "accountant," not remunerated for services.

(*h*) The aim is to improve not only the material but the moral condition of their members.

The capital is originally raised upon shares which are sold to members, the average cost of these shares being in the vicinity of $25. Regardless of the number of shares held each member has but one vote. No loans are made to others than members, and as a rule they are not made for more than four years, never for more than five. They are payable, not in a lump sum at a certain specified date, which often comes so hard on the borrower, but may be paid in installments. In every case the length of the term for the repayment of loans is fixed in advance, and this term and the amount of installments are proportioned to the object of the loan and the ability of the borrower to repay. These banks receive deposits both from members and outsiders, although confining all loans to members. The interest on loans ranges from 4¼ to 5 per cent. Satisfactorily indorsed notes or collaterals are accepted as security. All officers and trustees are chosen by the members and serve for four years. The "accountant," or cashier, receives about 1/10 of 1 per cent on all transactions. The societies reserve the right of recalling loans upon one to three months' notice, but this is very seldom done.

These Raiffeisen banks have succeeded in reducing the rates of interest for farmers from 6, 7 and 8 per cent down to 4 and 5 per cent. Again, funds are always available, while previous to the organization of these banks there was often great difficulty in securing loans under any conditions whatsoever. These societies are not permitted to speculate in any way. They are built upon a foundation of Christianity and loyalty, but at their meetings discussions of both denominational or political subjects are forbidden.

The founder of these local Raiffeisen societies, realizing from the beginning the need of combination in order to provide centers for equalization of funds by a non-profit seeking organization, finally solved this problem by the establishment of central banks in each province. The local banks adjust the finances of their members, and the central banks adjust the finances of the local societies in the same manner. The German Agricultural Central Loan Bank in turn balances the supply and demand among the provincial central banks, obtains credit and makes necessary investments for them.

This central bank has twelve branches in different parts of the country. While the local societies are in no way under government supervision, the central bank is subject to inspection by a representative of the government, as the State has made an appropriation in its aid upon which 3 per cent interest is paid to the State. Neither the inspector nor the government can close the bank, but in case of mismanagement the appropriation can be withdrawn. The original intention was to have other co-operative undertakings carried on by the local Raiffeisen societies, but experience has proved that this is impracticable, and has shown the advisability of independent organizations for these operations. These we will consider later.

The Landschaften, or Land-mortgage Loan Associations.

Of the various land-mortgage, or long-term, credit systems operative in Germany we shall discuss but one, known as the Landschaften and found largely in northern Germany, for it seems to me that it is this system, or some modification of it, which will eventually be found applicable to conditions in this country. It is a system which will appeal to any one who has ever had experience with a mortgage on the farm, for it eliminates entirely some disagreeable features which characterizes the negotiation of farm mortgages here.

To begin with, we at times have great difficulty in securing a purchaser for a farm mortgage unless the interest rate is high. This is due to several reasons: Such mortgages are not a liquid investment; the purchaser must ascertain the soundness of the title; he must determine the sufficiency of the security offered; he must see that interest and principal are collected; and he must see that the property involved does not deteriorate to such an extent that the security is endangered; and he must also see that taxes are paid. Then, too, the requirement of repayment in a lump sum, and the limited time for which mortgages are allowed to run, are very serious hindrances. These two factors in many instances force the mortgagor to either secure a renewal at a still higher rate of interest or else to contract a new mortgage. It is just these features which the mortgage-credit associations have been organized to eliminate, and this they have done, the so-called "Landschaften" especially.

To begin with, the farmer seeking a mortgage has no direct personal relations with the person who furnishes the money. He goes to the Landschaft and makes known his wants. The first step taken is to secure an impartial valuation of his property. This is made by three different parties: first, by two or three of the members of the Landschaft who live in his vicinity; second, by an independent valuer, such as the professor of agriculture in the nearest university; and third, by the officials of the Landschaft. The lowest of the three valuations is then taken as a basis for the loan, which, as a further precaution, is limited to only two-thirds of the lowest valuation. The borrower does not receive this amount in actual cash, but is given bonds to the specified amount of which he himself then disposes. He may sell them through his own banker, or the banking department connected with the Landschaft will sell them for him in the open market. The one who buys these bonds, and is really the mortgagee, has as security not only this individual mortgage but the pool of all mortgages in the hands of the Landschaft, and, in addition, the reserve fund which the organization is constantly building up. The law provides that the money of widows and orphans may be invested only in government bonds or in Landschaften bonds, the security and stability of which is thus recognized, and is due largely to the fact that the government has supervision over the organizations, each of which represents one political district.

Borrower and lender, then, do not come into any direct personal contact. The lender secures the interest on his investment, not from the borrower, but from the Landschaft. This is payable on the 1st of April and is usually 3½ per cent. If at any time he desires to make other use of his principal he cannot "foreclose," neither can he collect from the Landschaft. He simply sells his bonds in the open market.

Now as to the borrower. The day before the Landschaft has to pay the interest on its bonds it collects the interest from its members who are carrying mortgages. The rate of interest collected is 4 per cent; the ½ per cent difference between this and what the lender receives is used to meet running expenses first, and then to build up a surplus or reserve fund.

Each year the borrower pays also a fixed sum which goes toward the reduction of the principal, until at the end, usually, of either forty-five or fifty-four years the mortgage is amortized or "cancelled." The payments in excess of the running expenses and what goes into the reserve fund are used to buy up the bonds, so that when the mortgage becomes amortized the entire bond issue upon it has been bought up. If, however, the borrower fails to pay the interest, his land may be sold in the open market, and owing to the low valuation which has been placed upon it, a larger amount than the bond issue must invariably be realized. The Landschaft is reimbursed for the bonds issued and the balance goes back to the borrower. In this way the organization and the bondholders are protected, and then, too, there is also the surplus to fall back upon.

All officers and directors of Landschaften are appointed by the King, and the books and accounts are inspected and audited every month by law officers. There is, in addition, a special deputy appointed by the King to control the conduct of the Landschaft. Every possible precaution against mismanagement is thus taken, and here lies the secret of their success. It seems to me that this system, or some variation of it, combining availability of funds, low and at stable rates of interest, freedom from danger of foreclosure and gradual amortization, could be and should be worked out and put into practice as a solution to the problem of long-term credit here in America. The system itself is sound, and its success in this country would depend very largely upon the reliability and capacity of its officers.

Business Co-operation.

The subject of co-operative rural credits is very closely allied to that of business co-operation among farmers, as it requires credit to finance the co-operative societies. We have already made some progress in co-operative buying and selling in this country. The citrus fruit growers of the west, the apple producers of Oregon and Washington, and the dairymen of the northwest are among our foremost examples, not to mention the cranberry growers of Cape Cod. The fullest development, however, has as yet been reached only in foreign countries.

The co-operative societies in Germany comprise supply societies, dairying associations, corn-selling and granary associations, cattle-selling societies, egg-selling societies, electricity societies, machine societies and several minor kinds.

The supply societies deal mainly in fertilizers and feeding stuffs. One, two or three parishes are usually included in the jurisdiction of a single society, the area being governed by its ability to furnish enough members to secure the advantages of purchasing in bulk. Central organizations, representing all local societies in a province or State, are organized to make the buying power still greater and thus reduce costs still further.

There are three principal types of co-operative dairies, — those in which the cream is separated and butter made, but the milk and buttermilk is returned to the producers; those which sell new milk or utilize the new milk for making butter and cheese and use the by-products as food for pigs; and those known as cream depots which only separate the cream, which is then sent to a central dairy or to the towns. A milk supply from at least 300 to 400 cows must be guaranteed before definite steps toward organizing a society are taken. Members must deliver to the central station all milk not needed for use on the farm or in the home. Payment is usually based on the fat content. Central organizations have been formed to some extent.

The co-operative grain-selling societies aim to secure for the producer improved facilities for drying, cleaning and grading seeds; to regulate prices by reservation of supply; to enable the farmers to secure credit with corn in the warehouse as security; to lessen or eliminate payments to middlemen; and to reduce transportation charges.

The cattle-selling associations aim at the elimination of superfluous charges in getting cattle to the market; but although attempts have been made in Germany to establish co-operative slaughterhouses similar to those in Denmark they have as yet been unsuccessful. The majority of the societies sell on commission, and all animals are insured against damage in transit and against partial or total loss at the hands of the inspectors. Many societies maintain their own system of insurance.

The co-operative egg-selling societies, in addition to the grading and handling of eggs, seek to promote the poultry industry by advising their members as to breeding and feeding, turning their attention to better methods of housing, and selling them desirable birds at very low prices.

During recent years there has been a very rapid growth of co-operative societies for providing their members with electric light and power. There are at present about 700 of these societies. A scarcity of farm labor and the introduction of different kinds of electrical farm machinery have been factors in a rapid increase in the number of these societies during the past few years. The low cost of maintenance of such machines; the absence of expense when they are not in use; the ease and quickness of their operation; the possibility of one man's operating several machines at the same time; their freedom from fire risk, and their cleanliness, all favor the use of electricity as a farm power. Its use has also been found to be relatively very economical. These societies are of three types, — those producing and distributing power, those owning their installation but securing their electricity from other sources, and those composed of groups of consumers who guarantee the purchase of certain amounts of power and thus obtain reduced rates.

Other societies in operation are vine-growers societies, beet-sugar factories, breeding societies and land purchase and settlement societies.

An industry in Germany which assumes at least a partially co-operative form is the distilling of denatured alcohol. The distilleries are scattered through the country, about 4,000 in all, with a central selling depot in Berlin. The industry is based upon the utilization of the potato crop, nearly 80 per cent of all German alcohol being produced from this tuber, whereby the crop is made a paying one. By concentrating 900 bushels into the original weight of 100 bushels, and in this transformation using only the starch and returning the balance of the product to the farm to be fed to stock and returned again to the land, an exceedingly profitable industry was created.

All of the regulation German co-operative societies are composed of at least seven persons banded together for the furtherance of common business ends. These must take shares and make themselves jointly and severally liable, either to a fixed amount per share or to the full extent of their property. The larger number of societies have organized central banks or trading stations for provinces or States, and have further strengthened their status by creating central banks or stations operating over Prussia or Germany.

BUSINESS CO-OPERATION IN AUSTRIA-HUNGARY.

In Austria-Hungary the co-operative movement began little over sixty years ago, but became important with the founding of the Budapest Central Co-operative Creamery, upon the incentive of the Minister of Agriculture, in 1883. The 1912 report shows a membership of 140 farmers holding 648 shares. When organized the value of shares was 800 kronen, or $160 each. The association owns a large plant which we visited. The milk comes in from the surrounding country in large cans, and is weighed and turned into the large pasteurizing tank. Then follows the bottling for market. Sweet milk, baby milk and "sour milk" are sold. Some of the milk is separated, part of the cream being sold and butter made from the remainder. All milk is delivered to retail shops, most of which deal in milk or milk products exclusively, selling from pushcarts as well as directly from the store. Seven hundred men and women are employed to handle the output of this association, which amounted, in the month of April, 1913, to 1,909,600 liters (2,055,360 quarts) of milk. The farmers are paid according to the fat content of the milk, which ranged from 3.24 to 3.8 per cent, averaging about 3.6 per cent.

I have described the city co-operative milk plant. The Minister of Agriculture has the following to say in regard to the co-operative village dairy associations: —

> Endeavors to form Village Dairy Co-operative associations were, for a long time, unsuccessful, as our people were not inclined to take up with strange movements, nor did they think it worth while to combine for the sale of their output. It was very difficult to convince small farmers that it would pay to establish an association which needed some thousands of crowns initial capital. The Minister, however, finally succeeded in persuading the inhabitants of Maria-Kemend County to form an association. Hardly half of the farmers entered, but as the business became established, every owner of a business, every owner of a cow, to the last man, eventually

joined. The output of milk beyond domestic requirements, to the extent of 1,300 to 1,400 liters daily, was delivered to the association. Butter and curds (cheese) are made by machinery, and the milk itself brings in a clear 12 heller (2½ cents) per liter. In this manner the members cleared 3,500 kronen ($700) during the year for milk, which previously was either consumed in the house or wasted. This opened a new source of income, produced greater benefit year by year, and quickly became a potent factor in the enrichment of the village farmers.

In co-operative distribution Hungary is far advanced. There are two distinct types of societies formed known as the "organized," that is, under the jurisdiction of some central organization, and the "unorganized." The central society which controls the former supplies them with goods and working capital, and attends to the wholesale purchase of supplies. They deal mainly in household necessities, provisions, seed, commercial fertilizers, machines, tools, etc. The unorganized societies are independent individual institutions and may be divided into two classes, — those dealing in household requisites and provisions and those dealing in all kinds of agricultural supplies.

I had the pleasure of visiting the central supply house of the former type of organization in Budapest. The main building is filled with all kinds of merchandise, practically everything imaginable to eat, drink or wear, also farming machinery and implements, seed, fertilizers, etc.

The establishment included mills for grinding grain, salt, sugar and paint, apparatus for roasting coffee, and a box and cordage factory. An immense force of help is employed. In 1898 there were only 16 affiliated societies, while now the organization has so demonstrated its value that there are 1,195.

In Austria we found co-operative milk plants similar to those in Budapest and other parts of Hungary. Vienna, the capital, claims the largest co-operative dairy plant in existence. The milk is distributed to the sale depots in 102 wagons, which also transport the milk to the central plant as it arrives at the railway stations from the farms. The employees at the plant number 660, and 212 horses are kept.

Including the persons who deliver the milk the number of employees would be about 1,200. The branch depots have about 210 push carts for delivering the milk. This immense proposition began its career in 1881 with 33 members, which in 1911–12 had increased to 631. The milk at the railroad station is valued at 4½ cents per quart. Upon its arrival at the plant it is strained and pasteurized. A specialty is made of baby milk, prepared by special methods. Fresh milk is sold in sealed glass bottles, of which from 80,000 to 90,000 are filled every night. This is said to be the largest bottling plant in the world.

Business Co-operation in Denmark.

Of all the countries visited Denmark showed the most marked development of the different types of business co-operation. The Danes were leaders in the organization of co-operative business. Formerly a corn-producing country, with Germany as its principal market, Denmark in 1879 suddenly found that market cut off by an edict issued by the German Kaiser barring admission to this product. The Danes then turned their attention to cattle raising and later to pig raising and poultry growing. Then came the necessity of disposing of their new products, first the butter, then the bacon and later the eggs. Co-operation seemed the open door, and they were not long in taking advantage of it. The piecemeal adoption of co-operation, first for one purpose and then for another, resulted in a division of the different projects, into dairy societies, supply purchasing societies, bacon curing societies, etc., so that one man may belong to nine or ten different societies, each performing a separate function.

The co-operative dairy societies compel their members to feed only certain things, to cool their milk to a specified temperature immediately and hold it at that temperature, and to obey such similar regulations as will insure a uniform high-grade product. Each member, however, is glad to be obliged by the society to do these things, which result in larger sales, a sure market and better prices. These societies have meant great progress for the small dairy farmer. The following partial description of the "Dairy Sanderum," at Odense, taken from a circular given us upon our visit to that dairy, gives an idea of this type of co-operative organization: —

> Began to work on the 1st of May, 1910. Was established by the farmers of seven villages in the neighborhood of Odense, with 130 members and a total of 1,000 cows. Milk delivered in a year by its members is 2,750,000 kilograms (quarts). Besides, the dairy buys 1,000,000 kilograms from 50 farms, with 370 cows. The funds were raised by a loan for which all members are liable jointly and separately. This loan is to be amortized in a series of years. The transport of the milk from the producers to the dairy is carried on by the dairy itself, and takes place once a day at least. From the milk deliveries 30 per cent is returned to the providers and 15 per cent is used to make cheese of. The rest is sold in town as butter, cream, baby milk, sweet milk and skimmed milk. Accounts for the milk are settled every week, according to the butter quotation and the contents of fat found by testing every day. Ten per cent is retained to be paid out at the end of the year as overplus.

The dairy owns 23 wagons for transporting milk from the farmers and to its shops and customers. It also owns 12 horses for use in town delivery, but hires horses for bringing in the milk. The dairy has 20 stores in Odense selling only its products.

In this same town of Odense we visited a co-operative slaughterhouse representing about 7,000 farmers. The establishment itself is valued at 2,000,000 kroner ($536,000). The weekly killings amount to 2,200 hogs and 500 cattle, while the production per week averages 1,000 strips of bacon, 10 tons of lard, 10 tons of sausage and 10 tons of tinned goods. This is only one of many such organizations in Denmark, and is a sample of the co-operative societies which have resulted from the loss of the German market for corn and the consequent necessity of catering to the English trade. This trade demanded a different type of hog from the long legged Danish breed, and white Yorkshire boars were secured and crossed with the Danish breed, a cross which produced an ideal type for the market, weighing about 180 pounds and giving a uniform, standard product. Private concerns with large capital were at first heavy competitors, but their uneven output failed to successfully compete with the uniform product of the co-operative organizations.

Egg production forms a very important part of the Danish farmer's source of income. To increase the returns in this branch of agriculture, co-operative egg export societies have been formed. The most important of these is called the "Dansk-Andels Aegeksport." This was organized in 1895, and a fifth of all the eggs now exported from Denmark now pass through its hands. It embraces 550 affiliated branches with a total membership of 40,000 poultry keepers. Each branch has its local depot and appoints a collector who is paid a small commission on eggs collected. The eggs are purchased by weight, which induces the farmer to keep improved breeds and strains. There are stringent rules to insure that all eggs collected have been laid since the previous collection, and a penalty of a fine or expulsion is inflicted for violations. All eggs are branded with the trade-mark of the society and also the reference number of the branch society and the registered number of the member who supplied them. In this way it is possible to trace any defective egg from the breakfast table right back to the producer; and it is needless to say that very few poor eggs are found. The local depots forward the eggs to central packing stations situated in towns having convenient communication with English ports. The eggs are sorted into five different grades and packed in wool, 1,440 eggs in each box. There is the least possible delay between producer and consumer. This method insures the consumer a reliable article at a reasonable price; it guarantees the producer a maximum price as well, by the elimination of middlemen. The price paid the farmer is set by the society. At the end of each year the net profits are divided among the members in proportion to the value of the eggs received from each.

These are only some of the many forms of business cooperation in Denmark. Mention only can be made of the live-stock societies, one of which is the cow-testing association in aid of which the government appropriated 120,000 kroner (about $32,000); horse-breeding associations, pig-rearing societies, sheep-breeding societies, and societies for the insurance of live stock against loss from fire, storm and hail.

BUSINESS CO-OPERATION IN HOLLAND.

The sturdy Holland folk are indeed models of cleanliness. The stories we read of cow stables so clean that one could eat his meals in them are not exaggerated. The country is truly one large "spotless town." Marvellous progress has been made in co-operation in Holland, the government having propagated its principles with excellent results. Four forms of constitution have been drawn up, and prospective associations must adopt one of these as a basis of future operations.

Rural credit associations of the Raiffeisen type have made a remarkable growth. Co-operative purchasing societies for fertilizers and feeds are federated, but each branch does its own buying. Co-operative selling societies have mostly been organized for vegetables and fruit, and make use of the English market very largely. The dairy co-operative societies have been most highly perfected. These are federated into an "All-Netherlands Federation." The government early saw the advantage of State control of testing, and now does it all, placing at the service of the farmers skilled testers, who act also in the capacity of general advisers. The product which stands the test is branded with the sign of quality, "Nederlandsch Botercontrole," which is recognized as a guarantee in all markets. A form of society originally established in Switzerland and later in Denmark and Holland for recording milk yields, especially those obtained by breeding for production, has shown excellent results. In 1897 the average yield was 812 gallons; in 1904, 1,019 gallons. Since that time it has declined, but it still stands at 898 gallons of 3.5 per cent butter fat.

Holland has about 400 co-operative horse insurance societies, insuring about 40,000 animals, and 50 to 60 goat and sheep insurance societies, covering some 6,000 animals.

French Co-operation.

While the commission was in Paris, M. Albert Viger, who has several times been Minister of Agriculture, gave an address. He stated that there are 10,000 co-operative associations in France with a membership of 65,000. These societies purchase feeds, fertilizers, seeds and agricultural tools, and sell dairy and other products of the farmers.

Co-operative societies conduct mutual insurance against loss by fire, crop damage by hail, cattle loss from disease, and life insurance. These insurance societies are for farmers only and have a membership of 80,000. Individually these societies would be weak, but they are federated into one large and powerful association. This central organization maintains a legal department where any question of law is looked up, legal papers drawn or examined and legal advice given to members. As many as 10,000 letters are received and answered every year. The organization of this work was a difficult matter and required a deal of hard labor by M. Viger and his coworkers, for strong opposition, especially from insurance companies, was encountered. Their sign is two hands clasped and their motto, "One for all and all for one."

Much more might be said and written in regard to the wonderful trip of the commission and its opportunity for observing conditions and methods in the several countries visited. I feel, however, that I have given you to-night enough to at least set you thinking, and I trust that I have made clear some of the methods and practices which have proved so successful across the water. I feel that co-operation is the keynote of future progress and universal success in agriculture in this country. We shall do well to get out from under the framework of individualism upon which we have so long depended for shelter from competitive products, and upon the solid foundation of agriculture erect a framework of co-operation which will, beyond a question, be sufficient to sustain any burden of competition which it may be called upon to support.

I would suggest that the milk producers in the several different sections of the New England States build co-operative creameries convenient to the largest supply, expending only the amount of money really necessary to build and equip such plants, so that the farmers can stand ready to demand a living price for their milk; and if the buyers do not agree to the proposed price, the milk can be converted into butter and the skimmed milk returned to the farmers under the same method that is pursued in Denmark.

The interest on the money invested to carry out this scheme would be very small, and should be considered as belonging in the same class of expenditures as insurance.

Mr. George McKerrow, Wis., informs me that an organization of farmers in Woodstock, Ill., has carried out this plan successfully, and increased the price received by the producer for milk 10 cents per 100 pounds.

One other suggestion to help solve the milk question on the lines above recommended is that the Boston Chamber of Commerce, through its committee on agriculture, help finance a co-operative milk-selling plant in Boston. With such a plant in operation the producers would receive more for their product, while the price to consumers would not be increased. Indeed, I firmly believe that under co-operative methods the price to the consumer would be lowered. So let us strive for co-operative organization here in Massachusetts, to the end that our farming may be made more prosperous and our life upon the farm may be still more worth the living.

Mr. Taylor. I would like to ask Mr. Ellsworth what prices they get for milk in Germany.

Mr. Ellsworth. The farmer gets from 2¼ to 2½ cents a quart, and in some parts they get as high as 4 cents.

Mr. Myrick. I would like to make one point very briefly and very vigorously to the farmers of Massachusetts, and that is that the basis of co-operative success in Europe or in this country is going to be financial co-operation, banking co-operation, credit co-operation. Now, we have had in Massachusetts since 1909 a credit union law. It is one of the best laws; it embraces the best results of European experience in co-operative credit societies. We should have these co-operative credit societies formed under that law in every school district and township in Massachusetts. Though the law is here, it has not been agitated; it has not been considered by the farmers' organizations, and yet, it is a most excellent law. It was enacted in the State of Texas last year, and it came very near being enacted over in New York. That law should be supplemented by carrying out the Landschaft idea in the form of a land-mortgage bank, under the auspices and with the co-operation of the State, and a bill, or a standard measure, for that purpose has been drawn, and I have copies of it here for any one who is interested. This bill for a State land-mortgage bank should go through the Legislature of this State this next year, and Massachusetts should lead the way not only in the local co-operating banking under the law of 1909, but also in the land-mortgage bank.

Just one word further: of course, the price of money varies with supply and demand, but under a proper system of land-mortgage banking the current rate of interest, whether high or low, now paid, or ordinarily paid for mortgage money, will be sufficient not only to pay the interest, but also to pay the expenses and gradually pay off the principal.

Mr. Wilder. Right in that connection, why should we let this thing end in talk? This meeting is now an operative organization of the State of Massachusetts. It seems to me that this matter might be met right here this evening, or perhaps better to-morrow forenoon. We may, however, not have as good a meeting to-morrow morning as we have to-night, and it seems to me it might be a wise thing to choose a committee now to put this scheme in motion and report at our next meeting. We may talk about these things and we may listen to all these fine addresses, but what are we going to gain by it unless we co-operate and make a start of the thing?

Mr. Bursley. The Chair awaits any motion.

Mr. Myrick. Mr. Chairman, I make the motion that the president and secretary appoint a committee of seven on co-operative banking, for short terms and long terms, in the State of Massachusetts, this committee to have power to present a plan or method to the Legislature for whatever legislation may be necessary. As the gentleman has said, let us do something rather than spend so much time talking.

Mr. Wilder. I take great pleasure in seconding that motion.

Mr. Bursley. The motion is made and seconded.

Vote taken; motion passed.

Mr. Wilder. I don't want to take more than a minute, but Brother Morse has suggested that it might come before our next Governor. If it does, I would only urge that you put Mr. Morse on that committee, as he is a mighty good friend of Mr. Walsh's.

Mr. Bursley. We will heed the suggestion. Unless there is something further the meeting stands adjourned until to-morrow morning.

Third Day.

The third day's meeting was called to order at 10.35 a.m. by Secretary Wheeler, and the chairman, Mr. Bursley, announced that there were two or three matters of business left over from yesterday that the secretary wished to bring before the meeting before the lecture.

Secretary Wheeler. Last night the meeting voted to appoint a committee of seven to consider the question of rural credit and its relation to the law in Massachusetts, and perhaps to bring in a recommendation for a law in Massachusetts. I didn't discuss the matter last night because it was getting late, but I will say now that there is already a committee at work on this very subject. The Governor appointed three members from Massachusetts, one taken from the Grange, one from the Board of Agriculture, and one from the State College, to confer with the members of the commission that went from New England to Europe to study this very question, and that commission has appointed three members from all New England to consider the question of laws relating to rural credits. The members of that committee are Dr. Cance of the college, Mr. Chapman and myself. We have had one meeting already, and are going to hold a meeting of delegates from the New England States the last Tuesday and Wednesday in December, to confer on this subject of rural credits, and the possibility of introducing laws to the several New England States relative to rural credit banks and such other things now being done in Europe that might be advisable here. I think it would be well to change the vote that we passed last night, to make it read three instead of seven. I think that the delegates who are to meet in the latter part of December would very much like to have three members appointed by the Board of Agriculture — they needn't necessarily be members of the Board of Agriculture, but three members appointed by the Board — to confer with that committee, in order to get the whole question under discussion. I therefore move to reconsider the vote of the meeting last night.

Mr. Wilder. As I do not see Mr. Myrick here, it gives me great pleasure, as the seconder of that motion, to second this motion.

Mr. Bursley. It is moved and seconded that the vote of last night, whereby it was voted to name seven men to confer in this matter, be reconsidered.

Question voted on; vote passed.

Secretary Wheeler. I move now that a committee of three be appointed by the Chair to confer with this committee, which is known as the New England Committee of the American Commission, at their meeting at the end of December.

Motion seconded; vote passed.

Mr. Bursley. The Chair will name Messrs. J. Lewis Ellsworth of Worcester, Mr. F. W. Rane, the State Forester, and Mr. George F. Morse of the State Board of Agriculture as those three.

Ladies and Gentlemen: It gives me great pleasure to introduce at this hour as the presiding officer at this session, Mr. J. Lewis Ellsworth, ex-secretary of the Massachusetts State Board of Agriculture. [Applause.]

Secretary Wheeler. Just before Mr. Ellsworth takes the chair I want to make the announcement that the New England Alfalfa Growers' Association will meet directly after this meeting, and we would like to have everybody interested in the association, or all growers of alfalfa, stay with us and join the association, if they wish, after this meeting.

ADDRESS OF MR. J. LEWIS ELLSWORTH.

Mr. Chairman, Ladies and Gentlemen: It is perhaps a little unexpected to be called upon to preside at this meeting, as it is customary and usual that that pleasant duty be performed by some member of the Board. Possibly my association with them for so long, both as a member, which covers seventeen or eighteen years, and as secretary for ten years, has caused them to forget the rule or to overlook it, — because of my having been in continuous service for so long. I thank you for it, Mr. Chairman and gentlemen.

I won't take much of your time, because we have a lecturer here who is to talk to you upon the subject of alfalfa. I firmly believe that alfalfa is going to be the coming crop in Massachusetts and New England, and is going to be the salvation of our dairy farmers. I believe in it so thoroughly that I am glad so many clubs are being formed to encourage it. We all know that it is a difficult crop to raise in some ways, unless you know all the whys and wherefores and will carry out the methods correctly; and certainly the person who raises alfalfa successfully is going to be a better farmer.

It is a pleasure to introduce to you Mr. Joseph Wing of Woodland Farm, Mechanicsburg, O., who will speak to you on " Alfalfa Growing."

ALFALFA GROWING IN MASSACHUSETTS.

JOSEPH E. WING OF MECHANICSBURG, O.

Coming yesterday by day train through New York and then through western Massachusetts, I gazed out of the car windows with deep interest. I longed to know well the old land of my fathers. The little farms fascinated me. I longed to know whether it is well with them, whether or no there is prosperity there, and hope and good outlook. And as I came along, I mentally rebuilt many of the farms that I saw. I drained the marshy places. I took out the dividing fences and made the fields larger. I limed the fields, and covered some of them with alfalfa.

It was deeply borne in upon me that there is need for an alfalfa crusade in this old land, for from Rochester to Springfield I did not see one field that I was sure was set to alfalfa. Nor did I see one field that could not grow it, when conditions are made right. There is no crop that has greater possibilities for the New England farmer. It is a hardy plant. Frosts do not much damage it. You may not be well situated for corn growing, but you are well situated for growing alfalfa. You are not too far north, for they are growing it by thousands of acres in the Saskatchewan where the thermometer goes often to 50° below zero. They have learned that alfalfa does not winterkill there when they leave uncut the last growth. That is a lesson that Massachusetts farmers need to learn, perhaps, — to leave a strong growth to hold the snows of winter and to protect the crowns of the plant. On Woodland farm, our home in Ohio, we let the alfalfa go into winter always with a growth of a foot or more, and since we learned to do that we have had no winter-killing.

Doubtless you have before heard the praises of alfalfa sung and now you ask, "Is it a practicable crop for the Massachusetts farmer? Can I grow it? I live on the sandy river bottoms, can I grow it there? I live on the clay hills, can I grow it there also?"

To this I reply, "Yes, alfalfa will grow profitably on every farm in Massachusetts. There are no exceptions, so long as the drainage can be made good. Let us consider the requirements of the alfalfa plant. It makes its growth mainly by the aid of the bacteria that inhabit its roots. These bacteria live upon the air that is in the soil. They have the power to take nitrogen from the air, digest it, and make available the nitrogen for feeding the plants. The lesson is plain. Alfalfa must not be in a waterlogged soil. There must be air in the soil as well as moisture. Drainage, then, is the first requisite of an alfalfa field.

Lime is the second requisite. All the natural alfalfa-growing regions of the world have soils strongly impregnated with limestone. Idaho alfalfa fields have about 4 per cent of limestone in them. Colorado soils have at least as much.

Nebraska soils have from 1½ to 4 per cent of carbonate of lime. In Onondaga County, N. Y., where alfalfa grows so easily and so well, the soil is rich in lime; the rocks underlying the region are of limestone. Successful alfalfa growing is a mere matter of the chemistry of the soil, — that and the attention to a few easily learned likings of the plant.

When it comes to liming soils for alfalfa growing, one needs to forget most of what he has read of the functions of lime in the soil, because alfalfa uses lime in a different manner and for a different purpose from most other plants. The lime is for the bacteria, to enable them to gather the nitrogen from the air. Just how this is done we do not know, but this is sure: with abundant lime in the soil we find abundant and active nitrifying alfalfa bacteria, while without the lime we find few bacteria and these inactive. Markedly healthy alfalfa is always found to be on soils filled with limestone. To the alfalfa plant limestone in the soil is far more important and essential than manure.

Given drainage, a soil filled with air, then limestone, what comes next in the order of essentials to alfalfa culture? Next I put manure turned down deep under the soil. Once an alfalfa field is established, I never afterward put stable manure on it, but keep it going with chemicals instead; but I like well to turn under a good coat of manure when I establish a field. The manure does much more than feed the plant, it promotes bacterial life in the soil as well. Where a soil has much manure and much limestone as well, one will find his biggest, healthiest alfalfa; and if he will dig down in the soil he will find immense numbers of nodules containing the nitrifying bacteria. As alfalfa needs to be established only once in five or more years, one can afford to give it a lot of manure when he lays it down.

Next in order of importance I put phosphorus and potash. Alfalfa draws heavily on the soil for these mineral elements. I like to use basic slag for this purpose. Five hundred pounds to the acre seems with me to do as well at the outset as more, but as it is a fairly cheap substance, and does not leach away from the soil, one can just as well apply 1,000 pounds to the acre, and it will be all the better for it. For the potash, one can use either muriate or sulphate, whichever is the cheaper, and at rates of from 200 pounds per acre up, depending upon the soil. Soils derived from granite rocks, and good heavy clays, ought not to need much potash. Sandy soils and peaty soils will need more. It is an element that does not leach away; once applied, it is yours until the plants get it, that is, except on very sandy soils. On these, no doubt, frequent small applications will prove better than occasional large ones.

Inoculation comes next in order. I like to take soil from a good alfalfa field and sow it directly in front of a harrow at the rate of about 400 pounds to the acre, or more if it is readily available. That gives efficient inoculation, or one can use the commercial cultures on the seed. I think that these cultures are now generally successful. They cost more than does the method of soil inoculation; that is their only fault I think. Or one can use both soil and seed inoculation, and that is the best way of all. The better the inoculation the more rapid will be the growth of the young alfalfa; the sooner it will get above the weeds. Inoculation is never needed twice on the same land, for when alfalfa has once grown on it successfully it will remain inoculated for a very long time, if not forever.

Making the Seed Bed.

I like to plow deep for alfalfa, but to plow some time before seeding if I can; then work the land down firm and make the surface level. We use the plank drag for this. With the seed-bed level one can cover the seed accurately and not too deep. Half an inch is the proper depth of seeding; an inch may do no harm, but deeper than that will usually kill the seed.

We like to sow with an alfalfa drill, for then we can better regulate the rate of seeding and also the depth. The drill makes the seed go further also. Ten pounds of alfalfa seed drilled in to a proper depth in a good seed bed will give a very thick stand, and fifteen pounds sown broadcast will give enough. If the seed bed is poor, however, you must use more seed.

The time of sowing does not much matter, though I prefer to sow early in order to get a strong plant before winter comes. As soon as hard freezing is over in the spring one can sow, say, by April 15. If frosts come after the alfalfa has come up, all the better; they will kill some of the weeds and will not be likely to kill the alfalfa. Alfalfa may also be sown in May or June, July or even early in August. It will do well sown at any season, but better I think in New England if sown in early April or late July.

As to the nurse or cover crop, there are two kinds that are permissible and, I think, only two; and only in early spring should any nurse crop be sown. Beardless spring barley is the best, sown at the rate of 1 bushel to the acre, no more. It will make a good cutting of hay and the hay is of good quality. Oats shade the alfalfa too heavily and are an injury to it. In midsummer sow no nurse crop at all. The alfalfa then needs all the soil and all the moisture for its own uses.

The other permissible nurse crop is winter wheat, sown at the rate of a bushel to the acre at the same time that the alfalfa is sown in April. The effect is to discourage weeds and grass. The wheat cuts a small crop of hay of good quality and dies at midsummer, leaving the land clean for the alfalfa.

Each year on Woodland Farm we sow alfalfa in all three ways: alone, with barley and with wheat. We are not able to say which is the best, as all give us good stands; but the barley gives us the profit of a crop of hay, and then nearly as good a stand of alfalfa as when it is sown with wheat or alone. I advise the Massachusetts farmer to test the thing on his own land by sowing strips in each way and observing the result.

Having the alfalfa sown, and covered lightly by drawing a plank drag over it, or by some other method that will not cover it too deep, we may be certain that it will grow vigorously. The next thing is to know when to cut it. Not knowing this has cost many alfalfa growers dear. Barley or wheat is to be cut for hay, but we do not pay attention to these plants in deciding when to cut the alfalfa; instead we observe the little alfalfa plants with care to see when there start, down by the surface of the ground, little new shoots or buds. When these shoots start we cut the alfalfa, together with its nurse crop. We never cut sooner. That is the rule for cutting alfalfa during all its life, to cut it when the little shoots have appeared and not to cut it earlier; for it is ruin to alfalfa to cut it before these shoots appear. Why this is, no one knows, but take my word for it, it brings ruin; and perhaps more alfalfa fields in Massachusetts have been made unprofitable in this manner than in any other. Do not pay attention to bloom, or lack of bloom, as an index of when to cut, but be governed by the state of the basal shoots or buds entirely, and this throughout all the life of the plant.

Now, that is all, except one important thing: keep out of the alfalfa field except when you go in to make hay. Especially in winter do not allow any one to trespass in it. Let it alone. And remember when you are harvesting your 5 tons of hay per acre that alfalfa draws heavily on the soil for phosphorus and potash, and feed the alfalfa meadow every year. Our standard topdressing in Ohio is of acid phosphate or basic slag 500 pounds, and of muriate of potash 100 pounds per acre. Thus fed it keeps in strong growth for five to ten years at least. When June grass runs into the alfalfa, take a spring-tooth harrow and dig it out. Go over the land in two directions and tear out the last root of the grass. Bucher & Gibbs, Canton, O., make a special alfalfa spring-tooth harrow that will take out any sort of grass and leave the alfalfa unharmed. This is best done just after taking off a crop of hay, immediately after the hay is raked. The harrowing will not harm the alfalfa; will do it good, in fact.

Now let's go back to the lime question, seeing that it is the key to alfalfa growing in Massachusetts. I like to use the unburned ground limestone. It is the cheapest and best source of lime for the soil, if one is so situated that he can get it. Happily, a beginning has been made in limestone grinding in your State. There cannot be a farm in Massachusetts that does not need a full carload of limestone. Buy it in bulk and get it in car lots at the low price, then use it liberally. I prefer to use as much as 8 tons to the acre of raw ground limestone or marble dust. Of course there are cases where this would be too costly, and less must be used at the start. Then additional lime can be applied later and worked in with the spring-tooth harrow. Of burned lime I would use from 2 tons up to the acre. There are localities where burned lime is the cheaper source of calcium. Ground limestone has, however, the better effect on alfalfa.

As to the probable profits. Any acre of land in Massachusetts that is tillable and drained can profitably be set to alfalfa. The cost for lime, fertilizers, manure, seed and labor may be as much as $50, or even more. The cost of lime and manure are the determining factors. The first year one gets two cuttings, supposing he sows in April. The first cutting is of barley hay, say 1½ tons to the acre. Later he gets a cutting of pure alfalfa hay, of about 1 ton to the acre. Next year he gets three cuttings, one of about 2 tons, one of 1½ tons, one of 1 ton, or from 4 to 4½ tons per acre.

There is no expense of seeding or preparing the land after the first year. One merely feeds back the chemicals that the alfalfa has withdrawn from the land and harvests with joy and great profit his crop. It is the surest crop there is except the pasture grass and the forest trees. There is no need whatever of failure in establishing alfalfa in Massachusetts. In recent years I have helped establish alfalfa on farms from Texas to Vermont, without a single failure. Why, just below New York, in northern New Jersey, at Plainsboro, is the Walker-Gordon farm with 475 acres of alfalfa, all recently established and all successful. From that farm they sell nearly $1,000 worth of milk each day, and it comes in large part from their own soil, through the channels of the alfalfa roots. That farm is not on especially favorable soil. Mr. Jeffers, the manager, is simply an alfalfa enthusiast, and manures, drains, limes, inoculates and sows the alfalfa with never a fear of failure. He buys an old, "worn out" farm and pulls out the old fence rows, cleans it up, manures and limes it, and sets the whole farm at once to alfalfa.

Gentlemen, last spring I came home to Woodland Farm from a long journey and found on the farm 100 acres of alfalfa that seemed to me especially beautiful and fine. I longed for men to come and see it, and so we announced that we would give a picnic on Woodland Farm, an Alfalfa Day picnic. The Governor came, Dean Price of our Agricultural College came, many notable men came; and to our bewildered joy there came also 3,500 men and women from our own State of Ohio and adjoining States.

It was one of the happiest days of my life. We tramped through the fields together and then assembled on the lawn, where lectures were given and information imparted how successfully to grow alfalfa. In a little booklet we have put pictures of this great gathering of farmers, and given quite careful instructions how to grow alfalfa. If you will send us your names we will be glad to send the booklet.

Question. I had a soil which is a light loam, with sand underneath, and I put on 2 tons of burnt lime on one-eighth of an acre, ten years ago; and at that place the alfalfa has done better than anywhere else.

Mr. Wing. That makes about 16 tons to the acre, and simply illustrates the fact that alfalfa is a plant that is crazy for lime.

Mr. Wilder. What about witch grass?

Mr. Wing. That is a terrible thing, especially in New England, isn't it? We find that two years of very thorough cultivation of corn will entirely eradicate it, but we cultivated that corn a little more and deeper than we ought to have for the good of the corn. We used two horses and cultivated with a sharp, narrow shovel that goes down deep and takes out the grass, and absolutely destroyed it in two years. We do not sow the alfalfa in land until the witch grass has been thoroughly cleaned out.

Mr. Olmstead. I find that if you wait until the alfalfa blossoms, you will get a pretty hard first cutting for good feeding.

Mr. Wing. Well, sometimes alfalfa will get a little bit harder the first cutting than you like, but even if it should, you must not cut before the shoots come. Now, I will tell you a little story. Down in Georgia I started some alfalfa for a gentleman. It got finer and finer. I got some ground limestone and put it on that poor, red clay soil, and made it grow marvelously, so that he got from some of the acres 5 tons to the acre, and it was a wonderful sight. Then he got a man down from the north, a mighty intelligent man, who came down to manage the alfalfa farm. This man knew cows wonderfully well, but he did not know alfalfa at all. The first time he cut the alfalfa he cut it two weeks too late. Naturally, it was very woody and the cows didn't like it. Then, he said, "I will remedy that," and he cut the new cutting ten days too soon. The cows liked that, but the alfalfa didn't like it, however; and after he had cut it once more ten days too soon, I never saw such a wreck as that field was. The next growth was yellow and red, and the weeds were over the top of it, and the alfalfa looked as though it was going to die; and he had 150 acres in that condition.

Prof. H. J. Wheeler. I wish you would say what you would do if a very severe attack of leaf blight struck your alfalfa, — whether you would cut it or leave it.

Mr. Wing. Dr. Wheeler, I would never cut it, even with leaf blight, until the shoots appeared. By the way, the leaf blight, in my experience, comes very little if a man has his soil chemically right and if he hasn't been trespassing on it in some way. I found some places where the fishermen had made a path through the alfalfa, as they went down to fish, and the leaf blight followed along where they went, and where the teams turn around in the alfalfa, where the corn fields join onto it, it also appears; but in the 100 acres we have in alfalfa at Woodland Farm we have no blight except in spots like these. But even if I did have it, I would not cut the alfalfa until the little shoots come. I might feel awfully sorry, but I wouldn't cut.

Professor Wheeler. In the case of long protracted drought, with, say, three weeks of no rain, it becomes woody and the leaves drop.

Mr. Wing. I believe even then, even with the long drought and the leaves dropping off, I would wait for the little shoots. I would be afraid to cut before they appear.

Mr. Palmerton. Why do you recommend muriate of potash instead of sulphate?

Mr. Wing. Because it is cheaper with us, that's all. I should think one would do almost as well as the other, would it not, Professor Wheeler?

Professor Wheeler. I think the muriate has the advantage of being the more soluble, and if you put in enough lime you will be ahead of the game by using the muriate instead of the sulphate.

Secretary Wheeler. I would like to ask what kind of seed you use?

Mr. Wing. That is very important in New England. In New England I would not use the imported seed, because you are likely to get the Turkestan, which is not very productive under your conditions; and may even get something worse, such as that from Algeria, which will not stand the winter here; and you might get various kinds of weeds. I would rather get the seed for here from Montana, the Dakotas or

Nebraska, for that will be hardy, or else the Grim, which is a Minnesota strain which has been grown a long time.

Professor Wheeler. Won't you speak about curing and the danger of spontaneous combustion?

Mr. Wing. Oh, yes. Well, the little leaves have in them nearly all of the fat and the protein, actually more than is in wheat bran or middlings. Now, what would you think of having one of your hired men go out and cover an acre with middlings or wheat bran? You would say, "Heavens! What a waste," and yet there are men who do what amounts to the same thing with their alfalfa. The lesson is to rake it before the leaves drop off, while they are still tough enough to hang on. You can't tell when that will be, but I was going to say I would begin mowing in the afternoon and make the hay the next afternoon, but I am not sure about that. I would let it lie there long enough, then rake it in small windrows. Our rakers have these instructions, to make the windrows small, and then make the shocks not wide and spread all over the ground, but narrow and tall, and when they are put up in that way the stems have a drooping tendency and a big rain can fall and hardly damage it, and it may stay in the shocks a day or two. But you must not leave it there very long, because the young alfalfa is going to come right up and will be bleached under the shock. So, if the next day is good and hot, about 10 or 11 o'clock come out and open it about four or five forkfuls, and then it may be turned over and be dry enough to be ready for the barn.

Dr. Wheeler spoke about spontaneous combustion. A great many barns are burned from putting in alfalfa hay that wasn't dry enough. Get it as dry as you can, — not bone dry, but it should never be wet enough for moisture to be wrung out of it; that is our test. That should be the very outside limit; and get it as much dryer than that as you can. I have seen it go into a barn holding 120 tons, and come out without much damage. It has come out yellow or brown, but never had damage from mold. However, in a barn where you only put a few loads you must get it dry or you will have some mold.

That is all I know about curing, except the various ways of putting it up on frames. It is a good plan, of course, to have covers to put over it. I have had a hay cap made of sheeting about 42 inches square. Mr. Jeffreys, in his big alfalfa farm in New Jersey, has them, and he has a wire like a woman's hat pin that he sticks in each corner to hold it on the shock.

Mr. Palmerton. I would like to ask something further about lime; you spoke of using ground limestone as preferable, perhaps, to burned lime. Did I understand you correctly?

Mr. Wing. I think it makes bigger alfalfa.

Mr. Palmerton. Now, in New England here we are offered a ground marble which is as insoluble as sharks' teeth.

Mr. Wing. Ground marble dust?

Mr. Palmerton. Well, I should say granulated marble, and I want to know whether that is preferable to hydrated lime or burned lime, — so-called air-slacked lime, — or whether a good carbonate of lime, shell marl or something of that sort would be all right.

Mr. Wing. It is all a question of price. Will you please tell me what the marble dust is costing you?

Mr. Palmerton. Down here in this section, about $4 or $5 a ton.

Mr. Wing. That is too much. I believe there is a place somewhere in western Massachusetts where they grind it and put it on the car for $1.50 or $1.25 a ton. They put it on the car for $1.25 in carloads, and if there is one farm in New England that couldn't use a carload of limestone, I don't know where it is. You ought to buy it in carload lots. That price of $5 a ton for ground marble dust is entirely too high. I would rather use burned lime than the marble dust at that price. But I don't know that it makes a great difference what form you use, if you remember that the unburned only has about half as much calcium as the burned. Marl has good results if it has enough calcium.

Mr. F. H. Ray. I bought lime last year for $4.75, and dry marl for $6. We pay $3.50 for lime at the quarry, and pay $1.75 to get it out. We can buy marl for $6 a ton, and burned limestone I think costs us $7.

Mr. Wing. Burned limestone would be cheaper than the marl at that rate. Now, I think you need a cheaper source; you need lots of places that are grinding it. Oyster shell ground makes a good source.

Mr. Ray. I think it costs about $5 a ton delivered, in carload lots.

Mr. Wing. We have worked up a cheaper source of supply in the west, for some reason, than you have here. We do something that is rather a joke on the lime grinders. We buy screenings from the limestone quarries that they mean to sell to the concrete workers. We buy it for 75 cents a yard, and a yard is 2,800 pounds, and by putting it on in larger quantities we get fine results. Some of you might be so situated that you could get it.

Mr. Ray. We can buy ground lime ash for about $7 a ton.

Mr. Wing. Some lime and some potash in that. However, that is pretty expensive, too.

Mr. W. L. Mitchell. I believe that many of you are not aware of the compulsory by-product of the lime from our kilns and the lime burners, which I accidentally ran across some years ago, and which is usually sold and delivered under $7. In fact, we have a good quality of lime ash, of which the supply is limited, but it costs not over $3, usually a little less than that, carrying a little wood ash, with from 50 to 75 cents or $1 per ton of plant food value, often, and from 45 to 50 cents worth of lime.

Mr. Wing. Very good.

Mr. Mitchell. Then we have a lot of stacked lime, a by-product of the kiln, stacked sometimes higher than this room, which is partly recarbonated and still takes a long time to airslack through the stack, getting a little combined moisture, which doesn't seem to show much more than the hydrated, but costs about the same. That supply is going to be open. If you can get it on the basis of freight at $1.50, for $4.50 per ton in bulk, with that plant food in it, it seems to me something important that has been overlooked. In New York State they have tried to get it and have offered more money, but I have felt an interest in New England, and New England has had her share so far.

Mr. PALMERTON. Might I ask for the best people to deal with?

Mr. MITCHELL. There are several kilns near Pittsfield not owned by the lime trust.

Mr. PALMERTON. The rate from there to here is something like $2.25 a ton.

Mr. MITCHELL. It is 5⅓ cents, and going east, only $1.50 a ton, clear into Boston for $1.40 a ton, on the Boston & Albany road. The other roads have not given us suitable lime rates, the Boston & Maine in particular.

Mr. WING. The railroad people, a great many of them, are interested in agriculture and they have the farmers in mind, and it seems to me that if they are properly interviewed they might learn to give you the right sort of lime rate. In Illinois and several other western States the roads haul it for ½ cent a ton a mile, and that is the rate you ought to have here.

Secretary WHEELER. I would like to ask what is the relative advantage between inoculating with some of the bacterial preparations or cultures and with soil. Do you not think that using soil, taking it from one farm or one center to another and sowing it, is likely to introduce very dangerous weeds which wouldn't be introduced by using the culture?

Mr. WING. There is something in that. Cultures cost $2 an acre, and that is my first objection. I believe they are now fairly efficient, and if you have used the amount of manure that you really ought to have, you will get inoculation with the culture, I am sure. However, we have never been particularly afraid of weeds in alfalfa. I believe you have more permanent ones in Massachusetts than we have.

Mr. MAYO. This is an introduced weed (indicating a plant).

Mr. WING. There may be something in that which might frighten me more than I have been frightened.

Professor Brooks. The plant which has been held up by the speaker, which somewhat resembles the wild strawberry, is what we call cinquefoil, or, in English, five fingers. There are several species of that, and this one is the most common. The gentleman who brought it here in talking with me said that he thought it had killed the alfalfa. I told him that while he might be right, I thought it was probable it was more a symptom than a cause; that it indicated an acid condition of the soil, and that was the reason the alfalfa died. Now, while I am on my feet — and I will say I hope there is a representative of the New York, New Haven & Hartford Railroad present — I might say that while it is fashionable to say a great deal against the New Haven road in these days, I happen to know that its management has taken up this matter of furnishing the farmers cheaper lime. I believe, indeed, that I brought the matter to their attention among the first. They are establishing a plant in western Connecticut for grinding limestone, and they propose to sell it at the lowest possible rate, and will give reduced freight rates to any points reached by their lines. I am not able to say just what the rates will be, but I know that that is their plan.

Mr. Wing. That is splendid.

Mr. Mayo. I would like to know if you think it is possible by hybridization to get an alfalfa plant which is more drought resistant, a more vigorous grower and one that would have more growth of foliage.

Mr. Wing. Well, Professor Hanson is working on the hybridization of alfalfa, and we will wait for him and see what comes out of it.

Mr. F. E. Peck. I would like to ask how you get the lime deep enough. Do you plow it in?

Mr. Wing. We like to apply half of it before plowing and the other half afterward. Then the half that is put in before plowing is turned under, and the next half is mixed with the disc harrow.

Mr. Peck. Do you apply it again after the crop is established?

Mr. Wing. Yes, we have done that, too, with fine results.

Adjournment, followed by meeting of the New England Alfalfa Growers' Association.

SUMMER FIELD MEETING

OF THE

STATE BOARD OF AGRICULTURE

AT

BARNSTABLE.

JULY 31 AND AUG. 1, 1913.

SUMMER FIELD MEETING.

The summer field meeting of the Board was held at Barnstable, July 31 and August 1, in connection with the State Grange. There was a splendid attendance; the day was fine, and a few exhibits of farm tools and machinery served to attract the people considerably. The International Harvester Company made an especially interesting demonstration of tractor plowing, and the Ames Implement and Seed Company also made an exhibit of farm machinery. The following speakers presented subjects of interest to Cape Cod: Prof. J. C. Graham on poultry and Dr. H. J. Franklin on cranberries.

The morning session was conducted by the Board, and the afternoon session by the Grange. Many of the Board members visited several of the cranberry bogs in the vicinity, which are unusual sights to those living in the western part of the State.

BULLETINS

MASSACHUSETTS BOARD OF AGRICULTURE

PUBLISHED IN

MASSACHUSETTS CROP REPORTS, 1913.

Massachusetts peaches. — A feast for the eyes.

PEACH GROWING IN WESTERN MASSACHUSETTS.[1]

ADDRESS BY L. W. RICE OF WILBRAHAM, AT THE NINETEENTH ANNUAL MEETING OF THE MASSACHUSETTS FRUIT GROWERS' ASSOCIATION.

Establishing an Orchard.

Location. — First choose the site of the orchard. This should be a place of good elevation with good air and water drainage, which sometimes is hard to find and purchase: The land should be cleared of all trees and rocks. This can be accomplished best, and with least expense, by using dynamite. An orchard can be raised if the stumps and rocks are not all cleared away, but in the end the cost of clearing is saved in broken tools, loss of time and unpleasantness while spraying and cultivating. It is a pleasure to work in an orchard that has been well cleared, while one in which the stumps and rocks have been left is constantly trying one's patience. We want to carry on our business so that the work in the orchard will be a pleasure; and it is a pleasure to work in a good orchard. If the land contains any wet places they should be tile drained. The tile should be placed 3½ feet deep, so that the roots of the trees will not displace them; also, so as to drain the soil deep enough to give the roots plenty of room. The land should be thoroughly plowed. This is a slow, tedious job on rough land. It is best to plow the land in the fall, for then it will be finer and in better shape than if left until spring. If, however, one is unable to plow until spring, and it be a dry spring, harrow every morning what was plowed the day before. In this way the land holds the moisture.

Selecting the Trees. — Next comes the problem of selecting the trees. This should also be done the previous fall in order to obtain the desired varieties and grades of trees. In selecting varieties it is best to choose such as will ripen in succession, so as to hold the market and distribute the labor over as long a period as possible. A good succession covering the period from about August 1 to September 15 is as follows: Greensboro, Waddell, Carman, Hiley, Belle of Georgia and Elberta. Chairs Choice comes later than the Elberta, but has been nearly a failure here. Don't plant it. A few years ago it would have been very desirable to get something later than the Elberta, but now so many peaches are put into cold storage and held until after the bulk of the crop is marketed that later ones do not bring as high prices as formerly. A No. 1, 4 to 5 foot yearling tree is a good grade for orchard planting.

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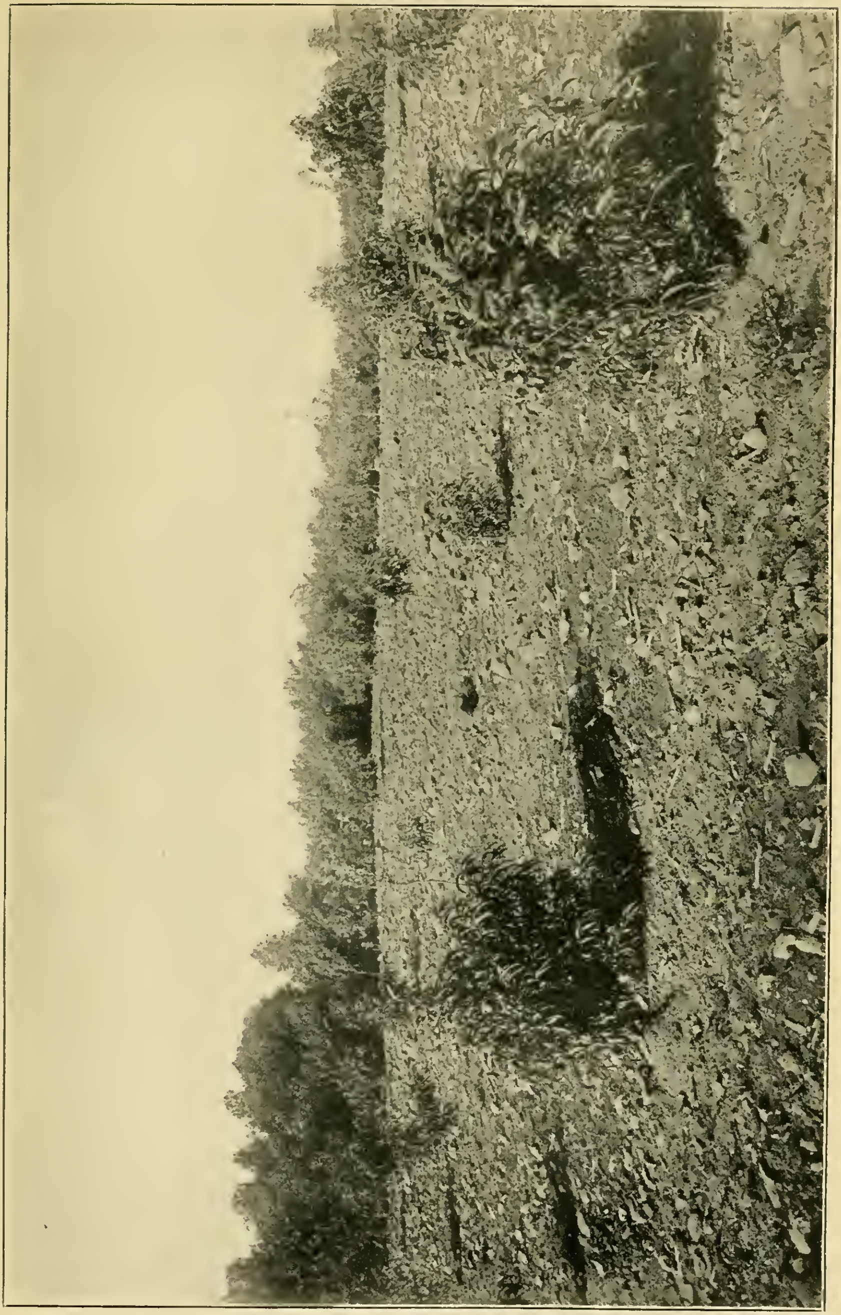
[1] Crop Report for June, 1913.

Setting out the Trees. — If one is ready to plant the trees within a few days after they are received they may be left in the box. The box should be put into a shed or barn cellar and covered over with hay or straw to keep the trees from drying out. If not ready to plant the trees at once, open the box, loosen the bundles and cut the body of the tree off for about 20 inches above the bud, cutting off all limbs. Cut off the broken parts of the roots, also, and dig out the borers. The trees should then be placed in a trench deep enough so that they will be covered above where they are budded, taking pains to sift the dirt in around all the roots. Do not allow the roots to dry out. If possible the trench where the trees are to be placed should be in the lot where they are to be planted, as they are much handier and time is saved in carting. When it comes to setting out, it is well to have a barrel of water on a stone boat in the lot to wet the roots in. As to distance apart, the writer plants apple trees 32 by 40 feet, and plants two peach trees between one way, and one the other way, making the trees about 16 by 13 feet. This, no doubt, is too close for some localities, but here where the life of the peach tree is so short it is far enough apart. Dig the hole deep enough so there can be 2 or 3 inches of good top soil placed in the bottom. Then set the tree in the hole so that the place where it is budded will be a little below the level of the ground; sift the good soil in around and over the roots and tread firmly. Care should be taken not to injure the roots while treading. Put about a pound of bone or other good fertilizer into the hole and mix thoroughly with the soil. Next, fill the hole nearly full, leaving a little hollow with the tree in the center, so that when it rains the water will have a tendency to settle around the tree instead of running away from it.

Cultivation. — Cultivate and hoe the trees as you would care for a field of corn until the last of July or first of August. Sow oats and turnips or some other cover crop, such as vetch or clover, if you can grow it. If the land is steep, so that it is liable to wash, plow furrows along the side of the hill, beginning near the top and turning the furrow down hill to catch the water. Plow furrow so there will be fall enough to carry the water off. Plow similar furrows along the side of the hill as often as is necessary to take care of the water. These furrows should be plowed deep and cleaned out with a shovel; then scatter a little fertilizer in and on the furrow and sow oats rather thick and rake in. The oats will



Yearling trees.

help keep the furrow from washing. When the trees get so large it is impossible in some places to plow the furrows along the side of the hill all the way, plow them so as to catch the water, and if need be plow straight down the hill to carry the water off. It is much better to have a few deep gullies washed that can be filled up with stone than to have a lot of the top soil washed off, as would probably be the case if the water was allowed to run down over the surface of the hill.

Trim the little trees in August, forming the head. Trim a peach tree just opposite to what you would if you were raising a tree for a saw log. A tree with from five to seven branches at the crotch will not be nearly so apt to split down as one with only two or three branches. If the tree is so shaped as to make it impossible to form a good head, tie up one of the best branches so it will grow up straight. Later, cut off all the rest of the tree and form the head out of that branch. Late in the fall, just before it freezes up, bank the trees with dirt 10 or 12 inches high. Be careful to pack the dirt firmly. If pieces of turf are thrown up loosely mice are apt to get in and nest and gnaw the trees. This banking not only protects the tree from mice but it keeps the water from running or standing around it. Then, again, if it is an unusually severe winter and kills the tender tree back, it will not usually kill it below the top of the mound. That leaves plenty of live wood between the bud and the top of the mound from which new limbs will start, and a new head can be formed from one of these.

The writer used to raise a crop of corn or potatoes in the orchard the first year and gives clean cultivation to all the land every year after until the last of July or first of August. Experience has taught that it is mighty hard in this locality to raise a cover crop, after the trees are three or four years old, that will add much humus to the soil. So now I am trying to raise some legumes the first few years to store up humus for the orchard later.

Pruning. — The second spring cut off one-half or two-thirds of the last year's growth. Along in August or the first of September thin out the branches where they are too thick. From this time until time of fruiting do not allow the branches to become too thick, for it is fruit that we are after. If the head is thick the fruit may set, but it will drop. After the trees come into bearing they need very little trimming, except to cut off broken limbs and cut out the dead wood, with a little thinning of the head occasionally.

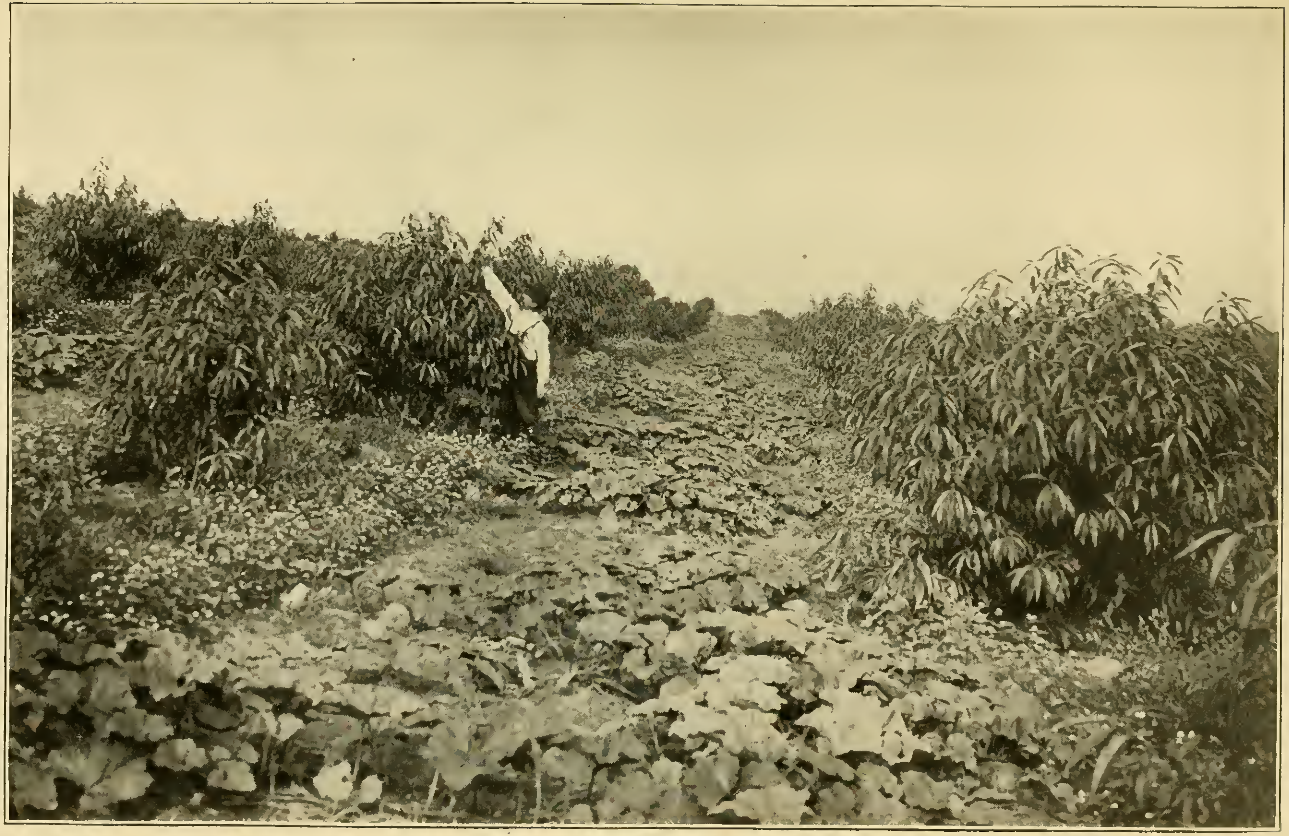
ORDER OF SEASON'S WORK.

Along in February we begin to trim the old trees, leaving the young ones until the last, as they are more apt to be killed back, and the longer we can leave them the plainer they show where they are killed. We pick up the brush on a wooden shod sled without any pole in it. This brings the load near the ground and takes very little room in turning. Just as soon as it does not freeze much during the night we begin to spray with lime-sulfur. In other words, we leave it just as long as possible and still get through before the leaves get started too much. We then plant what trees we have bought. This should be completed in April, but in favorable seasons if the work is not finished before the 10th or 12th of May the trees will grow all right. Make it a point, however, to get the trees planted just as early as possible.

Next comes the fertilizing of the older orchards and the harrowing. This may or may not be the first harrowing. Just as soon as the ground is dry enough we start the harrow, working one way one week and crossways the next. Let neither haying nor hoeing interfere with the harrowing, but keep at it every week from early spring until the last of July or first of August. When the fertilizing is done we dig the borers and hoe the young trees. In August and the first part of September we trim the young trees.

If we are blessed with a crop we begin to harvest it toward the last of July. Before harvesting begins we go through the orchard every five or six rows tying back the limbs and raking out the stone to make a road so as to get through with a one-horse wagon. This wagon should be so rigged as to carry 40 or 50 baskets. Two men can draw a great many more peaches in a day on a wagon of this kind than on one that will carry 15 or so. At this time of all times we want the work to count. The peaches are picked and set beside these roads. Later, the men go through and pick up the baskets and draw them to the packing shed, which is located in the orchard. Plan to keep all the work as near together as possible; then it is easier to look after, and if it is necessary to change part of the help from one kind of work to another, there is not so much lost time. For instance, if the packing shed is right in the orchard, and one wishes to load a wagon of 200 or 300 or more baskets in a hurry, he can call a gang of pickers and in a very few minutes the load is ready to go.

The peaches are picked by sight, not by touch, for the latter way takes too much time. Divide the pickers into gangs and put a foreman in charge of each gang. The size of the gangs depends upon the kind of men that make them up. If they are men of experience who will work anyway, then the foreman can take charge of 7 or 8, and pick himself. If, however, they are inexperienced pickers and are men who are in the habit of working under a boss, don't give the foreman more than 6 or 7, and tell him not to pick a peach himself. Don't try to economize by giving the foreman too many men; better hire another foreman. Being near our market we let the fruit ripen on the trees; therefore some of it gets the best



Low-headed peach trees.

of us and drops. The first thing every morning the men go through the orchard and pick up what have fallen. In this way they do not destroy them while working, and they are ready for the day's retail trade and the peddlers.

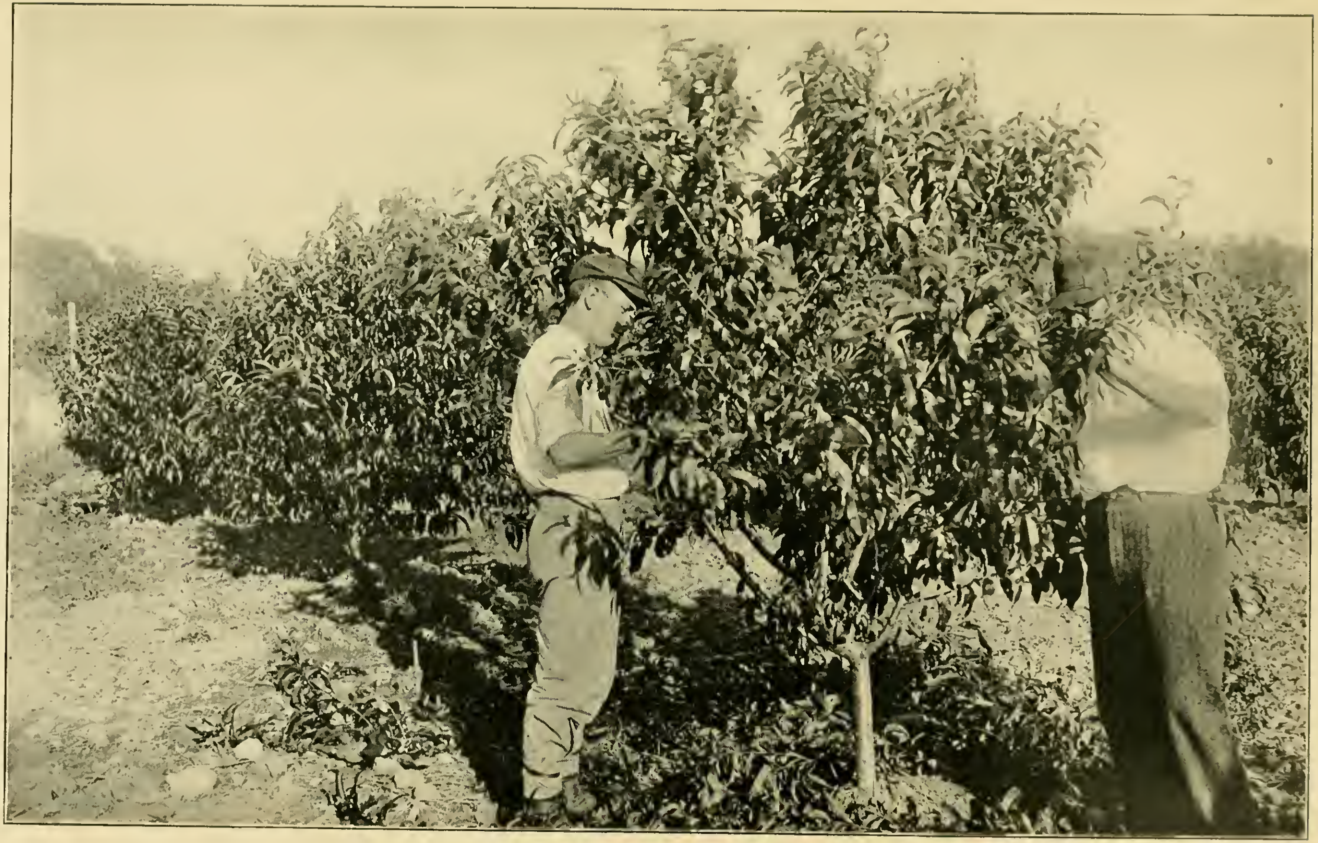
By going through the orchard in the winter and picking the dried or rotten peaches, and burning or burying them, and by going through the Greensboro just before they begin to get ripe and picking the rotten peaches, we have had very little trouble with peaches rotting on the trees. Let us go back for a few minutes to the trimming of the tree. We have made it a spreading tree, to allow the sun to get at the fruit to give it high color. Therefore, in order to save many of the trees from destruction, we are obliged to bolt many bad crotches and wire from one limb across to the opposite one. This can well be done by using about No. 108 screw eyes which are screwed into the wood. Wire across with about No. 12 wire. Many limbs can also be saved when carrying a heavy load by tying one limb to another with soft, strong string. Care should be taken when tying trees in this way not to tie too short, but to allow the limbs to bend well over before the string supports them. If they are tied too short it makes the bend in the limb too sharp, and it will break just above the string. After the crop is harvested these strings should be cut off to prevent them from injuring the trees. The fertilizer should be bought in the late fall or winter, so that it can be drawn during the slack season, and be on hand when needed. It is well to have a little nitrate of soda on hand; then if the trees are making a slow growth, and the fruit begins to drop too much, put on some, or if a tree here or there does not look quite thrifty doctor it with a little nitrogen. Do not put on too much at a time, but put it on two or three times if necessary.

After the peaches are unloaded at the sorting shed they are sorted by women. We insist that the fruit be handled with care both by pickers and sorters. One woman has charge over the other sorters. This woman also has charge of the retail trade. The peaches are sorted so that most of them are No. 1's or No. 2's. However, the very ripe ones and the specked ones are sorted out, also the very large ones, which are marked "extras." Make the peaches the same grade all through the basket. Toward the top, place the red side of the peach up and round the basket. A basket finished off this way is pleasing to the eye. After the peaches are sorted they are loaded on the wagon or wagons, according to the number of baskets on hand. One three-horse wagon carries 336 baskets. This wagon was built specially for hauling peaches. In the rush season it makes two trips a day, or rather in twenty-four hours, to Springfield wholesale houses, a distance of about 10 miles. It starts about 1 o'clock A.M., and returns about 9 or 10 o'clock. The wagon is again loaded and another team goes with it, returning in the evening or night, according to the traveling. This time the wagon is loaded by lantern light, ready to start in the morning.

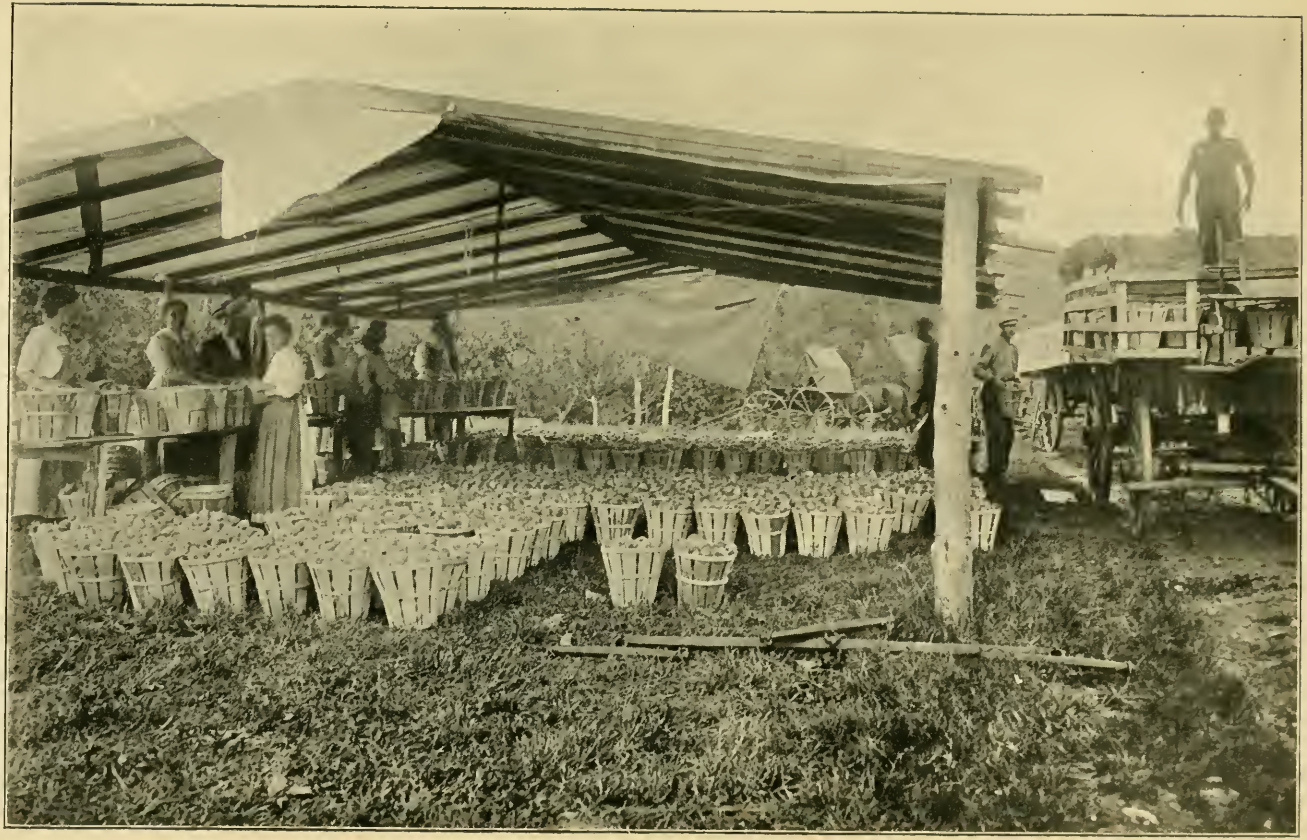
Now we have gotten the peaches to the wholesale houses, where they are sold on commission. Right here I want to say a word about the wholesale men. We read so much in the farm papers about the wholesale men, as if they were our enemies, trying to rob us, and so little about the help they are to us. How could we handle our crops without them? I consider the wholesale men my friends and helpers. If I did not have confidence in them I should want to go out of the fruit business to-day. I believe that there are just as upright, honest men in the wholesale business as there are in any other, raising peaches not excepted. Furnish them with the best of produce and they will be anxious for your patronage, and get the best prices that they can for you. Let us hope that occasionally, at least, the farm papers may have a word of praise for the wholesale men.

At harvesting time a man has a great deal to look after, and is very busy. The better his system the easier and better he can take care of his business. Having put a woman in charge of the sorters he can go into the sorting shed and look around. If he sees that the baskets are not full enough, or are too full, or that the sorting is not done right, he does not have to hunt up the one that made the mistake, but simply call the attention of the woman in charge to the error. She looks after it. If a customer comes and wishes to buy a few baskets of peaches he can just say, "The lady will wait on you." He can then go into the orchard and look around. If he finds that a tree has been skipped, that the peaches are being picked too green, or not close enough, or are being too roughly handled, or, again, if he wants a gang of men to go somewhere else to work, he simply has to tell the foreman, who looks out for the rest. In this way a man can handle an enormous amount of work. While men who have large gangs of men working all the year round have a system, we who have a large gang of men for only a few weeks are apt to handle them in a slipshod way.

Baskets. — Buy your baskets early, that is, just as soon as the winter is far enough advanced so that you are reasonably sure of a crop, so as to get the hauling out of the way and have the baskets on hand. Then, too, they are generally a little cheaper at this time than at harvest time. While harvesting keep close watch of your stock of baskets and the amount of peaches to be picked. If you see that you are going to run short order more just as soon as possible, for sometimes it is difficult to get baskets at this season. If you have not baskets enough to hold the crop, and cannot get them, then you must let the peaches rot on the ground, and you have had the expense, labor and anxiety all for nothing. Better carry over 1,000 baskets than be 100 short.



Pruning two-year-old trees in August.



Sorting shed.

Deer Damage. — In some fields the trees, especially apple trees, are badly damaged by deer. The writer built a fence around an 11-acre field, using woven wire 55 inches high at the bottom, and put two barbed wires about a foot apart on top, making the fence about 6½ feet high, putting the posts a rod apart at a cost of 82 cents a rod, put up. One of our good assessors told one of the men, "We can assess him more for that field next year for putting that fence around it." That is the way we fruit men have to take it. The State protects the deer. We try to protect our trees from the deer, and the assessor comes along and gives us a whack for doing it.

Pheasants. — In our own locality it looks as though we were going to have, or rather already have a pest much worse than the deer and harder to fence, — the pheasant. In the spring of 1911 there were many buds eaten in the writer's orchard. He was satisfied in his own mind that it was pheasant's work, for they were often seen in the orchard, but never caught budding. However, one of my neighbors saw one budding in his orchard a few days ago. These birds are getting to be very numerous in this section. Twenty-two were seen in an open field a few weeks ago.

The writer has an orchard where there was about 550 peach trees set ten years ago; this spring there are less than 200 left. In another orchard of about 750 peach trees set seven years ago, this spring there are 360 left. Yellows are to blame for nearly all of these trees being pulled out. The best stump puller that ever came into this section is a four-horse team, combined weight about 6,000 pounds.

CO-OPERATION.[1]

BY C. R. WHITE, PRESIDENT NEW YORK STATE VEGETABLE GROWERS' ASSOCIATION, IONIA, N. Y.

Some Suggestions toward solving One of the Most Vital Problems of the Present-day Farmer.

At the present time, when there is so much discussion regarding co-operation, and when there is such an apparent need for a great advance along that line, as relief from labor stringency, and complex methods of distribution of the necessities of life, it is evident to all who have studied the question of co-operation from the practical standpoint that the greatest need of the time is to educate the public to a thorough understanding of what real co-operation is, and to impress upon the would-be co-operator the fact that to co-operate is more than to become a sort of half-hearted member of some association, with no real obligation on his part; and it is further important that a warning should be given so that the public may not become the victim of smooth-tongued promoters or over-zealous enthusiasts, who see great opportunities in co-operation, but who have not become familiar with the human equation involved, which can be worked out only by education of the individual co-operators, and is, therefore, a rather slow and tedious undertaking.

Viewing the possible ways in which co-operation can be of benefit, especially to the farmer, without relation to the difficulties of putting them into operation, the field is so vast and the apparent benefits so great that it is indeed disheartening when he realizes how slow must be the growth which will eventually plant thoroughly well-organized associations throughout our country, having a membership whose loyalty to their association will be second only to their loyalty to country.

Co-operative insurance has long since ceased to be but an experiment. Millions upon millions of dollars of fire insurance is carried throughout the country by such companies. Rates have been materially reduced, and adjustments are made upon merit and justice instead of by avaricious and technical methods.

The co-operative creamery in thousands of cases has been of greatest benefit, and when intelligently organized and conducted has almost invariably been successful; and right here let me mention a possible combination which can be carried on to great advantage with the creamery plant, where the same management, same steam plant and many other factors beside would work very auspiciously together. This combination is the co-operative bakery and the co-operative laundry. Why should not the overworked country housewives, where the help question is so hard of solution, be relieved by up-to-date bakery and laundry methods which are enjoyed in the cities? There are thousands of plants of this kind in operation in Europe where such co-operation is enjoyed.

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[1] Crop Report for July, 1913.

Co-operative marketing is of the greatest importance if the "high cost of living," the now ever-present cry of the city consumer, is to cease. And yet at the same time there are many instances where the products of the farm waste in the field. Great savings can be made by co-operation in the purchase of supplies, and this can be worked to the greatest advantage in connection with the selling association, the same plants answering for both. By the combination of the two the association will be enabled to hire a competent manager, upon which so largely depends the success of all our efforts at co-operation.

Many States have enacted laws with the object in view of aiding co-operative efforts. In New York State a law for the incorporation of co-operative associations which is especially adapted to such organizations was enacted. Another act passed by the same Legislature authorized the Commissioner of Agriculture to appoint a superintendent of co-operation, whose duty is to assist in organization work. Such appointment was made, and the work is being carried forward in conjunction with the farm bureau. The New York State Grange Co-operative Committee are drafting plans of organization, and an organizer is to be appointed whose duty will be to assist local granges in organizing for co-operative work. Very many elaborate plans are being presented for bringing the producer and the consumer into closer relation, some of which have a great deal of merit. However, a word of warning should be given, for these schemes offer great opportunity for shrewd promoters to get rich at the expense of the would-be co-operators. In other cases, where there is no backing by those experienced in handling farm produce, so many difficulties are sure to arise with which the uninitiated will not be able to cope that their failure is certain. The old adage, "Great oaks from little acorns grow," I believe to be a safe guide for the supporters of co-operation. Many small, well-organized associations, where the membership is in close touch with their organization and with each other, from which they can learn true co-operation, hold a close sympathetic relation with the individual members which is impossible with a large institution whose membership is widely scattered. But some one will say no small organization can stand the expense of doing business along lines which will bring greatest success. Very well. A large central organization can be formed, and in many cases has been formed, from the small organizations, each small organization becoming a stockholder in the central organization and each sending a delegate to the stockholders' meetings. This gives a strong central body made up of picked men from the many smaller bodies. Because of the large volume of business, such organizations are enabled to get the very best experts to handle it, and further, it is always sought by the very best houses. Their strength commands the respect of the transportation companies. It enables them to have representatives in the field both at the receiving point and at the point of delivery, thus assuring the proper handling of the business.

From the foregoing it is easy to see the latent possibilities of co-operation. Some of our weak-kneed brothers will say it is visionary. But this is not so. I have not mentioned a single thing which is not represented by a living, working, successful institution, ranging from the small co-operative store to the mammoth Rochdale system of England, — which grew from an organization of nine weavers to its present huge proportions; and the eminently successful credit associations of Europe, — which assist the farmers to finance the farms and the institutions connected directly therewith; and in America the great citrus and deciduous fruit associations of the west.

We Americans are strong individualists and it is hard for us to give up that individual independence which is so diametrically opposed to co-operation; but necessity is the father of many great advances, and it is gradually crowding us to the advance line. As it forced European countries to co-operate in order to feed the vast population from a small territory, as it forced the great fruit interests of the west to seek relief through a community of actions, so it will steadily but surely drive us all to an understanding of the great benefits which are to be derived from co-operative efforts. To be sure, as has been the case in the past when co-operation has become an accomplished fact, the road will be strewn with the wreckage of failure, but so is it also strewn with wreckage in all commercial undertakings, and because of the failures it behooves us and enables us to take advantage of the past, and so organize that the pitfalls which have caused disasters before shall be avoided.

When shall the work of organization be commenced? The answer is simple: when the condition exists in marketing, purchasing, in dairy work or fruit growing, or in any other line of effort which can be materially improved by the combined effort of the citizens of the community. How shall the work of organization be carried out? The organizers should first make themselves familiar with the particular line of co-operative work which it is proposed to accomplish. It is essential that every member join with a correct understanding of what is expected of him and of what he has the right to expect in return from the association. The initial work of organization is so important that it is hardly possible to lay too much stress upon it. Lay your foundation well. Be careful that there is a perfect understanding of conditions, requirements and probable results. Be careful of your membership. It is not difficult, when getting subscribers, to keep out those very objectionable classes who never agree, who always want to take advantage, are habitual fault finders, or are dishonest; and, further, under no circumstances allow any one to become a member whose natural interests are not in accord with the purposes of the organization or who has interests which might be antagonistic. No one who is seeking position for himself should be allowed to become a member; if he is worthy, hire him, but do not allow him a voice in the membership. It is not necessary to have a large number to start with. A well-selected, loyal membership, which will work together with a determination to succeed, is the most desirable, even though small. All organizations should be incorporated. The sale of stock should be primarily for the purpose of obtaining members, although sufficient capital must be raised to carry on the business. Stock should not be sold with the view of an investment; therefore, the dividends on stock should be limited to a very nominal rate. All stock should be redeemable by the association at par, and a provision to that effect should be printed on the certificate and become a by-law of the organization. This provision should be operative when stock is offered for transfer, thus guarding against the possibility of the stock being bought up for the purpose of control. Dividends other than the nominal dividends paid on the stock should be paid to the co-operators in proportion to the volume of business done by them with the association. Do not be stingy in hiring a manager, for while the cost may seem large it will pay in the long run to have a competent man.

When the association is finally ready to do business there are some rules which should be followed explicitly. Absolutely no favors should be shown; treat every one alike, rich or poor, black or white; otherwise sore spots are sure to be made which are hard to heal. The strictest honesty should be exacted from all; a contract should be made with the members of the association which should define clearly and concisely what each party is to do for the other, upon what terms the transactions between the association and the individual are to be carried out, the amount of business to be transacted as near as possible and a forfeiture for breach of contract. In handling the transactions between members all contracts should be made the same as if no relation existed between them in the way of membership, and such contracts should be carefully drawn so as not to conflict with the anti-trust laws or with the decisions of the courts in relation to the restraint of trade. These contracts are very essential in order that the management may know what to expect, and after expenses have been incurred for the handling of the business of a member he should either produce the business so the profits will reimburse the association, or be compelled to make such reimbursement personally unless conditions which are beyond his control shall arise to prevent. It is extremely important that nothing shall be entered into in the way of a contract which can in any way be construed as seeking to restrain trade.

Many institutions have failed because they have anticipated their profits, paying upon estimates which proved to be too large and thereby exhausting the treasury. The most successful co-operative institutions do business with their members upon the market prices the same as they would with non-members, and, in fact, often transact business for non-members. At stated intervals, or when the business of a certain kind is closed up, the net benefits to which the members are entitled are declared as a dividend in proportion to the amount of business transacted with the individual members. This system has many advantages which will become apparent but which space will not permit of explanation here.

In handling of produce a system of pooling and insurance should be inaugurated so that the possible loss which is sure to come and is expected by all business houses will be distributed over the entire business, thus making what might be a heavy loss to the individual member practically nothing when borne by the entire membership thus co-operating to stand losses as well as to make profits.

In marketing produce I cannot too strongly urge the introduction of the packing-house system, each taking his product to the packing house or packing houses, which should be conveniently located and provided with proper facilities, and where trained, impartial packers pack every one's products to standard grades. High standard of quality should always be established and should be maintained at all times as to quality of product as well as to pack. Trade-mark brands should be used, so that the goods may become recognized in the market. A reputation is the most valuable asset in trade.

In conclusion, let me urge upon all co-operators to study well the methods used by the successful co-operative institutions, to be extremely careful in the introduction of innovations, for what may seem to be sure of success when viewed from the standpoint of our every-day competitive trade may fail absolutely when applied to co-operative work.

DIVERSIFIED FARM ACCOUNTING.[1]

BY L. A. SLOMAN OF AMESBURY, MASS.

PREFACE.

It isn't knowledge we lack, it is application.

Keeping accounts doesn't take time, it saves time, which is money. But keeping accounts without proper system means more books, more writing and unnecessary figures, and yet doesn't give clearly the showing made by each department.

It takes but a few seconds to make an entry now; disputes can't arise if it is done. It is a matter of habit only, soon becomes automatic, and keeps customers satisfied, which is the cheapest advertising.

Knowledge of losses avails you nothing without prompt application of the remedies. To judge the efficiency of the remedy you must have figures to show the results in different methods of handling each department.

Neatly printed billheads and letterheads, on good quality paper, are an incentive to make out bills and correspond. Your personality is conveyed by the quality of your stationery and neatness of the heading.

If you can't answer inquiries the day received, acknowledge them, stating when you will give the desired information.

Bills and statements should be sent out regularly, whether due or not.

Working capital means money on hand and in the bank. Confine your business to the working capital at your disposal.

Fix a credit limit at below one-half your working capital and keep the total owed you by all customers within that amount. So sure as you trust out an amount in excess of your ready money, percentage of profit will decrease. Failures often occur from just this reason.

Anticipate large future payments by installments set aside regularly from the time they were contracted.

Note the difference between elapsed time and actual time necessary to do a certain piece of work. It is loss in dollars and cents. Farm labor can be and should be accomplished on schedule time.

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[1] Crop Report for August, 1913.

Don't expect your help to beat the sun two hours in the morning and still be in the middle of their afternoon's work when it sets. Allow them regular, reasonable hours; proper, airy quarters; good, wholesome food and plenty of it; and fair wages to boot. Overlook any one of these and the others go for naught. You can't obtain and keep good help without them all.

Skilled help turns out most work with least fatigue.

The most successful men never hurry. They plan ahead.

Chores aren't boys' work. Scientific balanced ration feeding means cheaper and full capacity production, materially reducing costs.

Results depend no more on what you are doing than on the things you are not doing, or doing wrong.

The kind of farming and breed of stock you like best will pay you the largest profits. It is not necessary to practice the kind followed by the majority.

You don't have to go to Aroostook to raise potatoes, or west to raise beef or mutton. Proper crop rotation will produce the potatoes, and soil cropping the pastures will increase your milk, beef and mutton production.

New England farmers have the advantage of markets near by.

Statistics prove the trend of travel from the west and Canada to be towards and not from New England. Look well to your methods and opportunities as you are now located.

Convince yourself by proper accounting methods where your mistakes were; take a new lease on life and the Old Farm and you'll be surprised at the opportunities so long overlooked because they were near by.

In no other trade in this country to-day has the student the advantages of the farmer. Knowledge is yours for the asking, either of the department at Washington or state colleges and boards of agriculture.

It is vitally necessary that you have your name put on the mailing list. Address Division of Publications, Department of Agriculture, Washington, D. C. You then receive each month a list of pamphlets published, most of which are free, from which to select those applying to your needs. Write for it to-day.

Any man, however successful, who doesn't keep records and take account of stock frequently, can be shown where he is losing money. He may show a large yearly profit, but in some department, were records kept, a loss would be shown that was greatly reducing his legitimate profit.

Well-kept accounts showing knowledge of details of your business constitute one of the strongest arguments you can present to the banker when in need of more capital.

SMALL FARM ACCOUNTS.

Principles only can be discussed with intelligence as individual needs require different methods even for the same kind of business.

Enlist the assistance of the young folks. It will increase their interest. Interest generates ambition which spells success.

Weigh your milk. Count your eggs. Milk weights and egg yields kept on weekly or monthly sheets may eliminate unnecessary entries.

Avoid details. Let the accounting system grow with your business.

Necessary to use: a multi-column journal and card index, or indexed bill-board file.

Credit columns or pages are right-hand; debits left-hand.

The many columns of the journal serve the purpose of different books in keeping the business of departments separate, at the same time showing practically the profits or losses of any department at a glance. Debit column shows pay-outs, credit column, receipts.

Cards or bills in your file may be used exactly as a page in a ledger and accounts opened for departments the same as for customers. Columns most frequently used should be nearest the name columns, except that column to post from should come first of all.

Column footings are carried forward from page to page, and those of the credit side added together should always equal those of the debit side.

Accounts thus kept, by a double-entry system, provide for a check on errors and proof of cash.

Prove your cash daily by comparing the count of the money with the difference between footings of the cash columns.

It is preferable that your cash columns include check account at the bank, though you may have separate columns for it if desired.

All entries must first be made in the journal.

Every time you credit or charge anybody or anything you must charge or credit somebody or something to balance.

A person's capital or assets consists of their possessions, real and personal, cash on hand and in the bank, plus what is owed them, less what they owe.

Profit or loss for an exact period is the difference between the net assets at the start and close of the period.

Departments of which the credit side is larger than the debit side make the amount of profit shown by the difference.

Those where the debit side is the larger lose the difference.

Sales for a given period consist of the money received plus what is owed you (bills, not accounts), less what was owed you at the start.

Purchases: the cash paid out plus what you owe (bills, not accounts), less what you owed at the start.

Bills due or payable are memorandum transactions that have not before appeared in the journal, and are put in in a lump sum to balance up, and then reversed and taken out to start the next period.

Accounts due or payable have already been entered, and the balances will appear on your resource and liability sheet or trial balance when books are closed and balanced.

Cash, file, inventory, entry and profit and loss columns are necessary in the journal. Also date and narrow column for checking postings.

Others are optional, as poultry, pigs, sheep, produce, fruit, grain, tillage, expense, labor, household, stable, improvements and whatever others you need.

Bills receivable taken into consideration when you start your books should consist only of good, live customers you are sure will pay; slightly doubtful ones may be carried in a suspense account. Poor ones should not enter your books at all, though a record may be kept for reference.

Labor should be charged with your time, the time of the hands and their board.

Labor may be credited regularly and departments charged in proportion as time was spent. This provides a way of keeping the time charged up though the hands are paid irregularly.

Charge yourself regularly with a certain amount of money. Keep it in a separate pocket from your business money. This does not intend to cover household expenses, but saves charging up small amounts spent for personal use.

Household may be charged with fuel, cash paid out for groceries, and products exchanged for supplies or consumed.

Simplest way is to charge up time, seeds, fertilizer, manure, etc., used on house garden instead of produce as used.

Household should be credited with board for the hands and such labor as is performed in caring for poultry, milk or butter.

It is not at all superfluous to keep track of the meals consumed at your table. When the cost is computed at the end of the year your small bank account may be the result of too much entertaining.

Live as you like and entertain as much as you wish, but know just what you can afford.

DEBIT SIDE.

Improvement.	Dairy.	Pigs.	Sheep.	Poultry.	Produce.	File.	Ledger Accounts.	Cash received.	Date.	Ledger, Page or File.	
–	–	–	–	–	–	–	–	$550 76	Dec. 1	–	Cash and bank.
–	–	–	–	–	–	–	$1,000 00	–	–	3	Land and buildings.
–	–	–	–	–	–	–	40 00	–	–	11	Produce.
–	–	–	–	–	–	–	200 00	–	–	13	Poultry.
–	–	–	–	–	–	–	80 00	–	–	15	Sheep.
–	–	–	–	–	–	–	30 00	–	–	17	Pigs.
–	–	–	–	–	–	–	75 00	–	–	19	Dairy.
–	–	–	–	–	–	–	278 90	–	–	5	Utensils and implements.
–	–	–	–	–	–	–	10 00				Poultry,
–	–	–	–	–	–	–	3 70	–	–	1	Pigs, } Capital.
–	–	–	–	–	–	–	25 00				Dairy,
–	–	–	–	–	–	–	83 60	–	–	–	Bills due you.
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	Reverse.
–	–	–	–	–	–	–	38 70	–	–	9	Bills owed.
–	$45 00	$10 00	$3 60	$20 00	$5 00	–	–	–	–	–	Produce.
–	–	–	–	–	–	$8 00	–	–	–	–	Geo. Jones.
–	–	25	–	–	–	–	–	–	–	–	Skim milk.
–	50	–	–	–	–	–	–	–	–	–	Cream.
–	–	–	–	–	–	–	6 25	–	–	23	Grain.
–	–	–	–	–	–	–	–	10 00	–	–	For old bill.
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	
–	–	–	–	–	–	–	–	–	–	–	

CREDIT SIDE.

	Ledger, Page or File.	Cash paid out.	Ledger Accounts.	Produce.	File.	Poultry.	Sheep.	Pigs.	Dairy.	Stable.
Capital,	1	–	$2,254 66	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
Bills owed,	9	–	38 70	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
Produce, Poultry, Sheep, Pigs, Dairy, } Capital,	1	–	5 00 20 00 3 60 10 00 45 00	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
Entries,	–	–	–	–	–	–	–	–	–	–
Poultry, etc.,	–	–	–	–	–	$10 00	–	$3 70	$25 00	–
Bills due,	9	–	83 60	–	–	–	–	–	–	–
1 can cream,	–	–	–	–	–	–	–	–	8 00	–
Geo. Jones,	–	–	–	–	$0 25	–	–	–	–	–
Stable,	–	–	–	–	–	–	–	–	–	$0 50
Eggs,	–	$0 25	–	–	–	6 00	–	–	–	–
C. Murphy,	–	–	–	–	–	–	–	10 00	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–

Silage, hay and other roughage may be credited to tillage and charged to fodder account at market prices, less manurial value if to be fed.

Fodder account may be credited and stock charged as fed.

Stock should be credited with manure. Government pamphlet for values.

Manure account may be credited and charged where used.

Cement manure pits pay 50 per cent dividends. In other words, extra value in two years' manure pays for cost of construction.

Stable may be credited and other departments charged with work done.

Stock to be fattened may be handled as follows: credit dairy and charge live stock; credit sheep, charge mutton, etc., weighing if possible at time of transfer and charging feed and care to new department to ascertain cost of fattening.

Date and customers' name columns may appear on either right or left page of journal as debits or credits permit of space.

Improvements should be kept track of in order to give a clearer idea of the selling value as well as to show where the profits go.

Expenses should be charged regularly with such amounts for taxes, insurance and interest (on money invested, even if no mortgage) as will anticipate them in full when due.

If you can't show profits besides wages for yourself and interest on the money invested, poor crops and accidental loss of stock may wipe out your living expenses even.

Charge expense regularly with depreciation in such amounts as will cover average expectation of life of the stock, usefulness of equipment and repairs of the buildings. You have thus set aside before drawing profits a fund out of which stock and implements may be replaced and repairs made. It is like putting money in the bank.

Should you wish to draw profits from the business it is well to open a surplus account and a percentage of each period's profits may be charged to it. This provides you with a steady drawing account when bad crops and losses cut profits, even when losing.

Keep your personal drawings and expenses within earnings.

Whether or not you have a dollar in the bank, if instructions are followed as outlined, it is in the business and you haven't become your own worst customer. You don't allow the hands overdrafts.

File columns are to provide a close watch on total amount of money owed you at any time. Check over customers' accounts occasionally and see that total amount agrees with difference between footings of journal file columns.

Customers' charge entries may be made thus: credit amount of sale in proper department column of journal, write customer's name in name column, enter date (once for each day), and charge file column with amount of sale.

Head a bill for the customer (if a new one), post amount and put "F" in narrow column on debit side of journal. This shows you where to find account.

When payment is made on account, credit file column, enter customer's name and charge cash column. Post amount to bill and put "F" in narrow column on credit side, showing that credit has been given.

If payment is for full amount, bill may be destroyed or removed to dead index and returned to the live one when account is opened again.

Do not remove bills from file, except when paid in full, without leaving a memorandum thereon, though they may not be lost, as difference between file column footings is equal to total of all bills on file.

In Order to verify, close and balance Books.

List up the bills you owe (not accounts), enter lump through entry column credit side of journal, and post to resource and liabilities card. On debit side of journal charge subdivisions of this amount to departments as they owe.

Post difference of file column footings to resource and liabilities card.

Take an inventory of things susceptible to market fluctuations in value.

Inventory values should be purchase prices and not selling prices, else you are anticipating your profits and affecting next period's showing.

Post through entry column debit side to resource and liabilities card, and on credit side through department columns as they belong.

Expenses should be picked over and apportioned as they belong.

Credit inventory column and charge department columns with original inventory at start. Transfer differences in department column footings to profit and loss columns.

Post inventory, profit and loss column footings and cash and bank balance to resource and liabilities card.

All column footings now having been taken into consideration, your resource and liabilities card is now a complete statement showing condition of your business, and footings should balance. If not, look for errors in transferring amounts. If divisible by 9, without remainder, they are most likely transpositions of figures, such as posting 27 for 72, 35 for 53, or dollars for cents of same number.

TO RE-OPEN A SET OF BOOKS.

Return balances of cash, bank, file, and profit and loss to their proper columns in the journal.

Reverse the bills payable and inventory (taken at the close of the period) entries.

These reverse entries are necessary in order to keep payments of this period's cash for department bills owed last month from affecting last or next period's showing.

They enable you to show exact business and profits without regard to whether you owe or are owed more or less than at the start.

Note that inventory column leaves your department columns showing only receipts and expenditures, or, practically, your profits or losses at any stage of the period without necessitating balancing your books except for verification.

Entry columns are provided that you may watch more closely the amount owed you by all customers (by the file columns) than if department entries were made through these columns.

Profit and loss columns are provided that you may not have to open accounts for each department.

Resource and liabilities card takes place of cards for all.

The principles being explained the application rests with you according to your requirements.

Summing up the principles you will probably note that many things enter into the cost of production that you may not have considered before. Does your selling price allow margin enough to cover them?

Price is easily obtained. It's quality that is hard to get.

Watch your quality and demand the price. The higher the quality the more trouble you will have in keeping up with your orders.

Time spent on accounts will pay you more money than any department of your farm. Only a few minutes a day are necessary. Let them go and you have to wait for your memory. A memory that you think is infallible may cause you most loss, both in money and trade.

A customer lost isn't replaced by a new one gained. The lost one has reasons which do not make good advertising copy.

You may keep accounts on the barn door and be successful, but keep them you must or your stable may eat up the profit made by the much-despised hens.

Large Farm Accounts.

Necessary to use: multi-column journal, small ledger and indexed bill-board file.

The accounts kept in the ledger on diversified farming are generally as follows: —

- Capital.
- Personal.
- Bill account.
- Inventory account.
- Profit and loss.
- Stable.
- Utensils.
- Implements.
- Household.
- Fodder.
- Tillage.
- Grain.
- Labor.
- Produce.
- Pasturage.
- Taxes.
- Insurance.
- Dairy.
- Sheep.
- Pigs.
- Poultry.
- Improvements.
- Depreciations.
- Manure.
- Wood lot.
- Land and buildings.

Instructions for small farm accounts apply except as noted below.

All entries must first be made in the journal.

Inventory, entry and profit and loss columns in journal are unnecessary and are covered by the ledger account columns.

File and file columns are now used only for short-time customers and customers with small accounts, larger and long-winded accounts being carried in the ledger.

Unnecessary to have columns on both sides for some departments, only on the side where you have frequent entries, entries on the other side being made through the ledger account columns to the department account in the ledger.

Entries made in the ledger account columns should be immediately posted to their account in the ledger. When posted put the ledger page in the narrow column for reference.

You may have milk, cream and butter columns in the journal and all go to the credit of dairy in the ledger.

You may have department accounts in the ledger without any journal columns for them if entries are infrequent.

Do not post from any columns except ledger accounts' columns to the ledger, and from none but file columns to the file, except at closing.

You will have no resource and liability account in the ledger, as it is subdivided into accounts for each department.

Closing and reopening entries are made through ledger accounts' columns to accounts in the ledger.

CLOSING AND BALANCING BOOKS.

Take inventory. Subdivide expenses.

Take preliminary trial balance (consisting of credit balances in one column and debit balances in the other). This must take into consideration the footings of your journal columns, except ledger accounts' columns, as well as the ledger accounts. Footings of these columns should be equal.

Take into account bills payable and receivable.

Post footings of journal columns, except ledger accounts' columns, to the accounts in the ledger.

Make entries (through the journal) of balances of department accounts to profit and loss account.

Final trial balance will now prove your books and show your true standing.

REOPENING ENTRIES.

Bring file and cash accounts back to the journal.

Reverse inventory and bills payable and receivable entries.

Explanatory Entries. — Say land and buildings are worth $1,000; cash on hand and in bank, $550.76; bills receivable, $83.60; bills payable, $38.70; utensils and implements, $278.90. Inventory shows: cows, $75; hens, $200; pigs, $35; sheep, $80; and produce, $40.

Make entries as shown on accompanying pages. Capital account now shows your assets.

It is now necessary to reverse the bills payable entry so that when you pay out money in this period, for bills contracted in the previous one, your departments will have a credit to offset the charge against them of cash paid out for the last period's business.

Bills receivable entry is reversed that departments may have a charge against them to offset money received this period that was due to last period's business.

Individual stock or pen records should be kept in order to keep the departments up to their fullest capacity for business.

Entries in the usual course of business may be made as follows: —

George Jones buys a can of cream, $8; you bring back from him 3 cans of skim milk for the pigs, value, 25 cents. Stable is credited 50 cents for hauling the cream. You exchange a case of eggs, $6, for 4 bags of grain worth $6.25, and pay 25 cents cash to the miller. Charles Murphy pays $10 he owed for a pig sold previously to starting your accounts.

These explanations, by the changing of column or department headings. are of use for any and all kinds of business. They are not given with the intention of making you a bookkeeper. Stick to your last (as the cobbler says), call in clerical assistance. It will pay big.

It is very necessary, however, that you understand the principles of accounts if not the methods. You can't expect employees to do your thinking. If they were capable of it they wouldn't be employees long.

Make sure that everything that enters into the cost of production is taken into consideration. This must be personal knowledge.

Be unhampered by tradition. If you can't make a department pay after trying different methods drop it in favor of another.

FARM ICE HOUSES.[1]

BY B. S. PICKETT, M.S., PROFESSOR OF POMOLOGY, UNIVERSITY OF ILLINOIS, URBANA, ILL.

Massachusetts farmers in general are so familiar with the advantages in the use of ice on the farm during the summer that it is almost superfluous to call their attention again to these advantages. The use of ice for the cooling and preservation of milk, cream and butter has, however, been so long considered the principal object of ice-storage on the farm that it may not be out of place to call attention to some of the other advantages of having a supply of this cheapest of nature's refrigerating agents on hand.

The use of ice for the cooling of small fruits, including strawberries, raspberries, gooseberries and currants, has scarcely become, as yet, a general practice, other than as a means of holding them for a day or so for home consumption. Experiments in California, Ontario and in Australia have, however, indicated a great advantage in the precooling of many kinds of fruit as a means of improving their carrying capacity, and there is little doubt that the use of ice for the immediate cooling of fruits as they come from the plantations will come more and more into general use, particularly in a State like Massachusetts, where small-fruit culture must become of ever greater and greater importance in the fruit-growing industries of the State. A few of the larger producers of orchard fruits may also find it advantageous to use ice for the precooling, or even for the storage, of large quantities of fruit during the packing season, though the New England climate at this time of the year is, on the whole, rather favorable for the preservation of the orchard fruits until such time as they can be placed in regular city cold storage.

A convenient supply of ice on the farm provides also a good means of preserving butter, eggs and meats during the hot weather. It enables the farmer to market his perishable products at more convenient times, and sometimes enables him to avoid overstocked markets. It is a boon in case of sickness, and it is hardly necessary to say that it is almost an essential to the housewife in good housekeeping.

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[1] Crop Report for September, 1913.

The numerous streams, ponds and lakes of Massachusetts provide, with the help of the winter climate, a sufficient supply of ice for summer refrigeration on the farm at little more than the cost of the labor in harvesting the ice crop. With this readily available supply, and an appreciation of the advantages of storing sufficient for the summer's needs, the principal question in the minds of Massachusetts farmers will be in what manner to store the ice rather than whether or not storage is desirable. This article will, therefore, deal more directly with the types of storage houses than with theoretical considerations of the value of the ice during the summer season.

The earliest form of ice-storage in use was the cave or pit. Historical records show that both the Persians and the Romans made use of ice brought from mountain caves to cool their beverages during the summer, and the practice of storing in such places has continued to the present time. Caves and pits have the advantage of protection from the direct rays of the sun, and of a comparatively steady temperature throughout the entire season. They have, however, the very serious disadvantages of poor drainage, inaccessibility and inconvenience in storing, removing or sometimes in both storing and removing, the ice. Fig. 1 illustrates a comparatively modern type of ice pit, showing how it is provided with artificial drainage and with insulation, with a roof as an additional protection against the loss of ice.

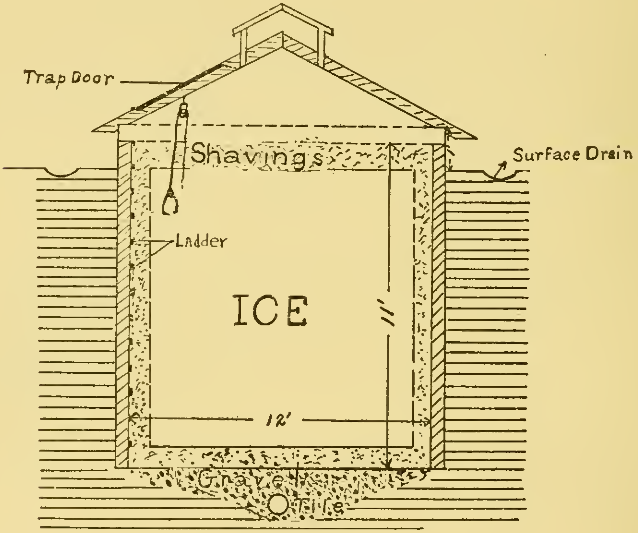


Fig. 1. — Ice pit.

Of comparatively recent introduction, but of almost equal primitiveness in construction, is the use of the ice stack. This method of storing ice is extremely simple and may be explained in a few words.

In a shaded place on a gentle northern slope a rough floor of rails, rough boards or logs is laid as nearly flat as the materials used will permit. These floor materials should be laid parallel with the slope so that the spaces and irregularities between them will provide drainage down the slope. Over these rough boards should be placed 8 inches of sawdust or mill shavings, or 12 inches of wild hay. The ice is then stacked up as squarely as the blocks will permit, and to a height about equal to the rectangular dimensions of the pile if the quantity to be stored is small, or to as great a height as can conveniently be handled in case the quantity is very large. The nearer cubical the whole pile, up to a convenient height for handling, the less the loss from melting will be. The whole pile must then be covered with sawdust, shavings or wild hay, and the top protected by a cover which will turn the rain. Usually there is a sufficient supply of used lumber about a farm for this purpose, but a canvas cover can be used if desired. Fig. 2 shows one method of covering an ice stack. Among the disadvantages in the use of the ice stack are the great waste in ice which must accompany the poor character of the insulation, and the difficulty of getting sufficient material to cover the entire stack. This latter difficulty is sometimes met by planting posts the height of the pile at its four corners at a distance of 8 to 10 inches from the corners of the stack, nailing on a few rough boards and confining the insulating material to the space between the boards and the ice. When this practice is followed, however, it will be seen that one is approaching the true building, or ice house, and it is practically a foregone conclusion that it would be much cheaper and more satisfactory in the long run to build a permanent rather than a temporary structure for the purpose. The ice stack is also likely to be inconvenient in location. A satisfactory place for it may not be available near the buildings. It is unsightly in appearance, and if

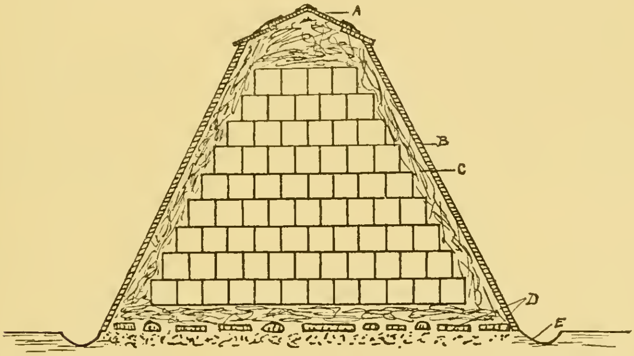


Fig. 2.—Ice stack. A, capboards held together by wire and staples; B, side boards standing on end and leaning against ice stack; C, wild hay; D, rough flooring; E, surface drain.

located at some distance from the house and barns it will not give the service desired. The ice stack is, however, of value as a means of supplementing an inadequate home supply during the early part of the season. This is particularly likely to be true on large dairy farms where the ice house is not of sufficient capacity to carry a full summer supply. Under these conditions an ice stack built near the pond where the ice is gathered, or at some place convenient to the barns, may have its place of usefulness.

The third type of farm ice-storage may be termed the makeshift ice house. It consists in the appropriation, for the purpose of storing ice, of one end of the woodshed, a box stall in the stable, a corner in a leanto shed, the tool house or an abandoned chicken house. Occasionally such a makeshift ice-storage may be satisfactory and hold as much ice as is needed. The probabilities are, however, that it will not permit of adequate insulation, and that it will not carry sufficient ice to supply the farm needs through the summer. Not being constructed for the immediate purpose of storing ice it will not be adequately drained or ventilated, and if located in a conspicuous part of the farmyard it may prove to be a very unsightly part of the farm equipment. If ice is stored in a makeshift house care must be taken to see that there is no danger from fire as a result of spontaneous combustion in the insulating material.

Of storage houses there are many sizes, forms and methods of construction. The essentials of an ice house are: first, capacity large enough for its purpose; second, good insulation so as to prevent rapid loss of the ice through melting; third, drainage to carry away the water from the bottom of the pile of ice, as it melts; fourth, ventilation at the top of the ice pile; fifth, convenience of location; sixth, an appearance that does not detract from the general attractiveness of the farm buildings; seventh, reasonable cost.

The size of the ice house must be calculated in cubic feet of capacity, allowing 45 to 50 cubic feet of space for each ton of ice to be stored. A house 12 feet square and 11 feet high will hold approximately 25 tons of ice, — sufficient to supply a moderate-sized farm where the consumption of ice for milk cooling is not exceptionally large, — allowing space for the insulating material.

The most effective insulating materials available are dead air, wood and paper. Brick, stone, earth and concrete are fair conductors of heat, and are therefore not desirable for insulating purposes, though brick, stone and concrete may in some cases be desirable as outside walls, either for the sake of their superior lasting qualities or because they may correspond to the materials used in other buildings on the farm in question. Since wood is the only material available for construction among those named as desirable for insulation, it is recommended as the most generally satisfactory material for the construction of ice houses. Dead-air spaces may be formed by an extremely careful construction of walls, but this would be entirely impractical in a farm ice house, and if dead air is to be used as an insulating material it must be obtained by the use of sawdust and shavings, both of which materials are fairly available to Massachusetts farmers. When tightly packed between the ice and the walls of the storage house, shavings and sawdust enmesh in their crevices large quantities of air which is practically immovable in character, or dead, as storage-house constructors speak of it. Considerable air is also contained in the pores of the sawdust and shavings, and it is this immovable air, even more than the material itself, which makes of sawdust and shavings good insulating materials. Hay is less desirable than sawdust or shavings because the air enmeshed in it is not so finely divided, and may circulate to some extent. It takes a larger quantity of hay, and hence more space between the ice and the walls of the building, to give the same amount of protection with this material as with shavings or sawdust. For the most perfect result from the use of hay, sawdust and shavings the material must be dry, as any of these materials when wet are fairly good conductors of heat. For the best result at least 8 inches of well-packed sawdust or shavings should be used between the ice and the walls, and the top of the ice should be covered to a depth of 10 inches. If hay is used at least 12 inches should be allowed between the ice and the walls, and 14 or 15 inches on the surface of the ice.

Drainage is necessary because the water from the melting ice is a good conductor of heat, and if it accumulates in the bottom of the ice house and stands up about the lower tiers of ice it will cause a rapid loss. It will, moreover, soon soak the insulating material and thus permit rapid conduction of heat directly from the walls to the main stack of ice. It is also unsanitary, and will cause a rapid rotting of the timbers in the ice house.

Drainage is secured by the selection of a well-drained site, or by placing a tile beneath the ice house. Where the house must be constructed on a soil which does not drain well naturally, an excavation should be made the size of the house and 12 inches in depth. In the center of this excavation should be placed a row of tile leading to a satisfactory outlet, and the entire excavation filled in covering the tile with coarse gravel or cinders.

Ventilation should be arranged for over the top of the ice stack. Where the building is completely closed, the air above the ice beneath the roof becomes highly heated and causes a rapid loss by direct radiation of heat to the ice. Reliance for insulation is placed on the sawdust, shavings or hay which immediately covers the ice, rather than upon the main body of air above this insulated covering. By placing a ventilator in the ridge of the roof, and leaving a 6-inch opening below the plates all around the side of the building, a sufficient circulation of air will be secured.

The farm ice house should be located convenient to the buildings and in as inconspicuous a spot as can be selected. It is a common practice to locate the ice house close to the milk room for the sake of convenience in handling the ice. Occasionally the ice house is located near the pond where the ice is obtained, but unless this is immediately accessible to the buildings the farmer will fail to make as much use out of the stored ice as he would if it were located within convenient reach.

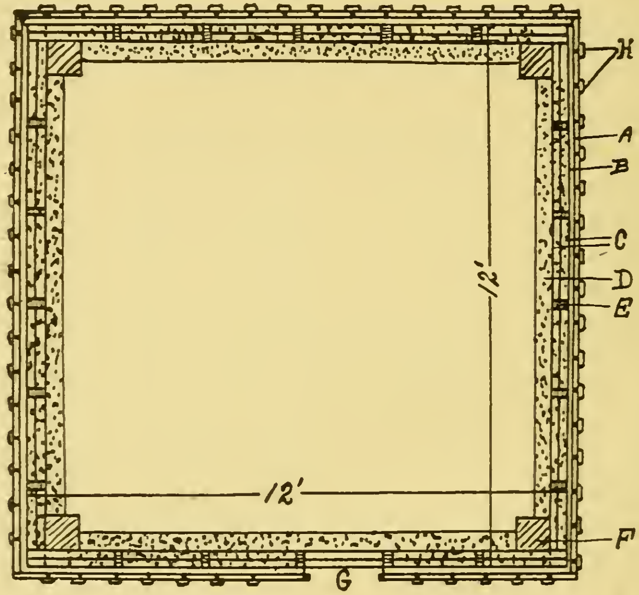


Fig. 3.—Well-built farm ice house plan. A, siding placed vertically; B, inside layer of boards placed horizontally; C, sills and plates made of two 2 by 4's spiked together; D, sawdust; E, 2 by 4 studs on 24 inch centers; F, posts about 7 by 7, 3 feet in ground and 11 feet above ground; G, opening for ice full height of house, and closed by boards placed in groove, constructed as shown in drawing; H, battens.

The appearance of the ice house must be left to the judgment of the constructor. Nothing more can be said than to indicate that it should be in keeping with the other buildings on the farm. The ice house is for an extremely utilitarian purpose, and ornate ornamentation on a structure of this kind is uncalled for and usually entirely out of place.

Ice houses that will carry ice satisfactorily through the summer may be built at very small cost. The framework may well consist of roughhewn posts gathered from the farmer's wood lot. No floor is necessary. A double ribband of 2 by 4's securely spiked to the posts will provide both plates and sills. The studding should consist of 2 by 4's on 24-inch centers. The walls may be built of a single layer of rough boards nailed to the outside of the studding, or, if a better construction is desired, with better appearance, building paper may be used over this first layer of boards, and a second layer of boards, planed on one side and matched for size, may be nailed vertically over the first layer, this second layer to be battened with 1¼-inch battens, breaking all the joints. The latter type of construction, while much neater and more lasting, is but little more effective in the preservation of the ice, provided sufficient insulation is used between the walls and the ice itself, the outer wall being essentially only a protection against the wind and weather. The roof is essential to keep out the rain, and as a protection against the direct rays of the sun, and must be the best constructed part of the

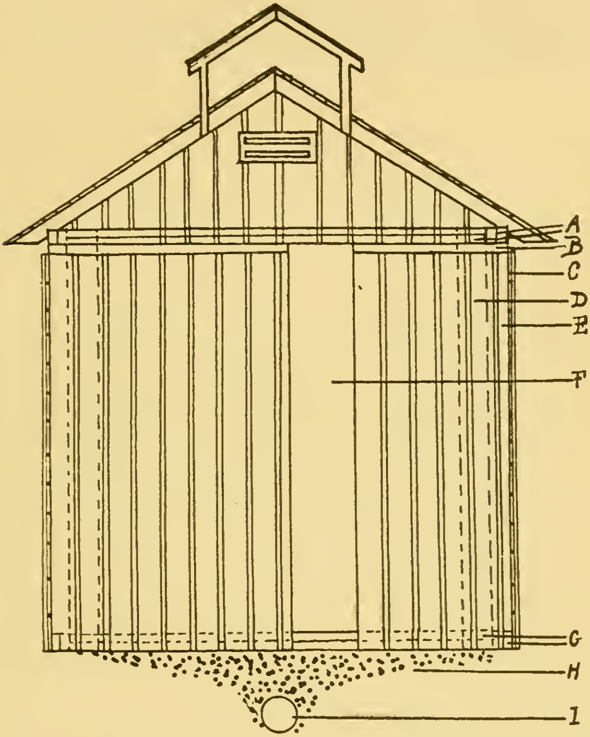


Fig. 4. — Well-built farm ice house. Elevation: A, plates; B, 6-inch open space between weather boarding and plates; C, weather boarding; D, posts (shown in dotted lines); E, studs; F, opening for ice; G, sills; H, gravel for drainage; I, tile.

building. It may be of shingles, sheet metal or some ready prepared roofing, all of which materials are thoroughly satisfactory with the exception of those which are black. An ice-house roof should preferably be light in color in order to reflect the rays of the sun.

An ice house, holding 30 to 50 tons of ice, of solid construction, properly drained, and neat in appearance will cost from $50, where the farmer supplies considerable of his own material and labor, to $125, where all the materials are purchased and labor hired for the construction of the house.

FARM WATER SUPPLIES.

BY S. P. GATES.

The question of the development of adequate and dependable water supplies for farms, situated beyond the limits of municipal supplies in Massachusetts, is yearly becoming a more serious problem. Until recent years most farms in the Bay State have depended for their water supply upon one or more dug wells or springs which, according to local traditions, "have never been known to go dry." Many farms are dependent entirely upon such sources for their water supply to-day. It is conceded that many of these old wells and springs which thrive only when moisture is abundant and the rainfall plenty, "never did go dry," prior to a decade ago. In those years a few hogsheads of water a day, obtained oftentimes under difficulty, sufficed for all requirements.

To-day the progressive farmer is seeking to obtain the advantage of certain luxuries on the farm, common to city homes, and the water consumption for domestic purposes alone has increased to a surprising extent. Beyond this, and of special vital importance from an agricultural standpoint, the problem of an abundant water supply for irrigating purposes is frequently a most perplexing and serious one. This is due to the fact that the demands upon these surface supplies are greatest in seasons of the year when, because of climatic conditions, the least amount of water is available. Surface springs and dug wells are supplied by the immediate rainfall, and, such being the case, the shortage of water from these supplies can be more readily understood after studying the official reports bearing upon the rainfall in Massachusetts, as prepared by the State Board of Health.

These observations were taken upon the Sudbury River watershed, and show the average rainfall for periods of five years since 1890.

	Inches.
1890 to 1894,	46.56
1895 to 1899,	46.72
1900 to 1904,	48.16
1905 to 1909,	41.81
1910 to 1911,	37.01

The comparatively light rainfall of recent years, the evaporation during the hot dry months of summer, and the increased consumption all figure prominently in the shortage of water from surface sources in the farming district.

The problems involved in the development of water supplies that can be depended upon during all seasons of the year have already been successfully worked out for many large farms and private estates in Massachusetts by those equipped by study and experience to prescribe the best method after examining the conditions.

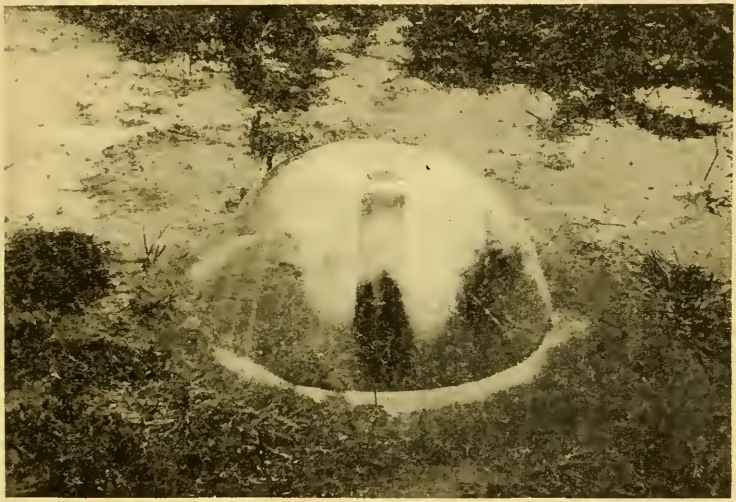
The development of water supplies from underground sources, or deep down in the bed rock, while long regarded as a mystery has proven to be the solution of the problem.

The water which falls upon the earth in the form of rain is disposed of in three distinct ways, — one portion suffers evaporation, a second portion runs over the surface and escapes into brooks and streams, while a third portion sinks into the ground. This third portion usually pursues a subterranean course, and during its journey frequently collects into well-defined channels and lakes. A careful study of the surface contours and geological conditions is necessary in locating these underground collecting basins. This must be done in order to determine the natural water courses in relation to the surrounding country and the position and inclination of the underlying bed rock, and to locate the deposits of sand and gravel without which no great amount of water can be obtained. In some places hereabouts, where surface indications might lead us to believe a good supply of water exists, none can be found. This is due to the fact that the stratum below the surface is very fine, hard-packed sand, or hardpan, which is practically impervious to water. Whenever in low land the formation is coarse sand or gravel, inexhaustible water supplies can be developed by the driven well method.

Flowing Wells at Stoughton, Mass., 35 feet deep.

Such wells are put down by hand and penetrate the gravel to a point where the best results are to be had. They were first driven in this region in about 1870. At the beginning they were merely pipes driven into the ground at random, and results were very uncertain. Locations are selected now with reference to the drainage area and the overlying earth deposits. These wells average from 35 to 40 feet in depth in Massachusetts, and will often yield from 40 to 50 gallons of water per minute. There are a great many systems of driven wells in the State to-day furnishing large supplies of excellent water for cities and towns, farms, institutions and industrial plants. Most of these systems consist of a number of 2½-inch wells connected to suction pipes of ample size to take care of the volume of water to be handled. They are connected in a way to produce the least possible friction, and the water from the main suction passes through a sand and air separator, thence to the pumping engine.

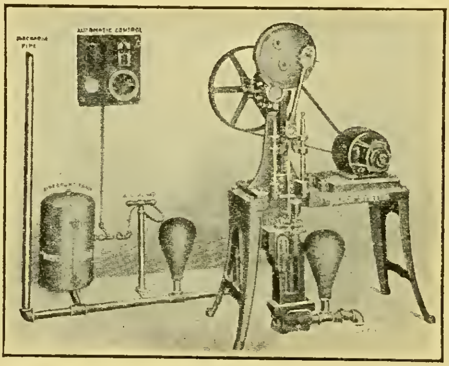
The most notable of the driven-well systems in Massachusetts is the municipal water supply plant at Lowell, where 5,500,000 gallons of water per day are pumped from wells of this type. In many farming districts of the State it is possible to obtain abundant and permanent water supplies by this method.



Flowing Well at Kingston, Mass., 40 feet deep.

The glacial deposits which overlie the bed rock throughout the State are variable in character. Wherever this deposit is clay or hardpan the driven well system is impracticable, but there is the deep drilled well to resort to. In sinking these wells an outer casing is driven down by steam power until rock is encountered. Upon striking the bed rock a hole of approximately the same diameter as the casing is drilled into it for several feet, and then gradually tapered down to the proper diameter to receive a smaller casing. This inner pipe constitutes the permanent well casing, and is firmly driven into the tapered hole, effectively shutting out the earth formation above the ledge. From this point the drilling is confined entirely to the bed rock. This bed rock in Massachusetts, like the glacial deposits, is variable in character, but is for the most part seamy, and these seams or fissures are water-bearing. In drilling, the seams are cut, and the water when released flows upward into the well and is ready to be pumped. The yield from wells of this type cannot be predetermined, but such wells are rarely failures. Data taken from the records of the pioneer artesian well company in the State, indicate the average depth of these wells to be from 250 to 300 feet, and the average yield from 50 to 60 gallons of water per minute. These deep wells furnish most satisfactory supplies, as the water is usually in a high state of purity and can be depended upon at all times, inasmuch as it has access to the wells at depths where it is not affected by surface conditions.

Unlike hand driven wells, surface conditions do not show the depth and dip of water-bearing seams in the bed rock, and they cannot be determined until the work is in progress and the seams opened up in drilling. Consequently wells of this type, in most cases, may be located at any convenient point in relation to the building to be supplied, thereby eliminating long lines of piping.



Electric Pumping Outfit.

Progressive well drillers, as a rule, keep accurate records of the formations passed through, and the depths where water is found. Accordingly, where work of a similar nature is contemplated, the best way to determine the probable depth and yield of a deep well is to consult the records of firms having had experience in the general location of the proposed work.

The modern drilled well, when properly constructed, is immune from the evils common to dug wells and other surface supplies. The method of connecting the well casing to the bed rock, from which point the well is cased all the way to the pump, prevents contamination from surface drainage and insures against the entrance of insects and reptiles.

There are various methods and so-called "systems" in vogue today for pumping, storing and distributing the water obtained by the methods as described above. Named in the probable order of their importance and popularity, the list of pumps is as follows: the electric pump; the gasolene engine driven pump; the steam driven pump; the hot air engine driven pump; and the windmill. For storing and distributing, the pressure tank, the gravity reservoir of concrete, and the gravity tank of wood or steel, on a skeleton tower of wood or steel, about cover the field.

Where electricity is available, the electric pump is probably the best solution of the pumping problem, as with this power the controlling switch may be located in the house or barn, where it will be accessible at all times, irrespective of the location of the pump. This is of considerable importance during the inclement weather of the winter season, and, coupled with the simplicity and safety of operation, which is such that a child or woman properly instructed may with impunity be appointed engineer, makes the electric pump the most desirable. Another feature which recommends the electric pump is the automatic control to which it readily lends itself, the pump automatically, and without manual assistance, starting and stopping as a high and low water level or a high and low pressure is obtained in the storage tank.

The advent of the automobile and the motor boat has gone far to popularize the gasolene engine as a motive power to drive the farm pump, having overcome the fear which many farmers had for gasolene, as well as creating, practically overnight, an abundant crop of gasolene engine repair shops, no town now being too small or isolated to support at least one dealer or mechanic capable of repairing any of the current makes of gasolene engines. The gasolene engine driven pump is compact and self-contained, and may be quickly started by a competent operator. It is highly efficient, and in general gives good satisfaction, being less desirable than the electric pump only in the fact that it requires considerable physical strength on the part of the operator, and cannot readily be automatically controlled. This is at times a hardship, especially during the winter season, if the location of the engine is at a considerable distance from the dwelling house.

The steam driven pump is too well known to require discussion, but is rapidly losing caste as a farm pump, owing to the cost of coal and of its transportation, or the necessity of constantly replenishing the fire, if wood is used as fuel. The amount of time required on the part of the operator tends to further discourage the present-day farmer in the use of this type of power. Also, in many cases, the electric or gasolene engine driven pump may be installed in a building already erected on the farm, whereas the use of the steam pump usually means the construction of an entirely new building.

The hot air engine driven pump is probably the simplest and safest engine driven pump on the market at the present day, but owing to its rather limited capacity, together with the element of time required on the part of the operator, causes its value as a farm pump to be rather questionable. This pump, however, is almost ideal for purely domestic use in a country house or summer cottage, where the use of water is comparatively limited and electricity is not available.

The windmill of our grandfathers' time needs no description. It has been a good and faithful servant, but the march of progress along the pathway of farm efficiency has discarded it together with many other implements and methods more or less primitive. Its chief sins are, or more properly speaking were, the inevitable yearly repairs due to the exposure to the elements; the hardship of climbing the tower to lubricate the mechanism at the top; the noise and unsightliness; and last and most important of all, the fact that the operation of the pump depended entirely upon the action of the wind.

For storing and distributing the water about the farm the pressure tank is without a rival. This type of tank is usually buried just outside the house or barn cellar, with one end of the tank protruding through the wall into the interior, thus providing an accessible and frost-proof location for all controlling valves. In larger installations a special pit is constructed around the head of tank or tanks. It is, of course, desirable about the farm, for agricultural as well as live-stock purposes, to preserve an even temperature of water the year round. This the pressure tank does to perfection, the water being drawn from the tank at practically the same temperature at which it leaves the well, irrespective of the season. Also a much larger measure of fire protection, as well as a better pressure for sprinkling and spraying, is obtained from the pressure tank than would ordinarily be obtained from a gravity system.

The gravity reservoir of concrete is possible only where the ground elevations are suitable, and the cost of construction, together with the cost of piping, should be carefully considered before this method is decided upon. The wooden tank on a skeleton tower of steel or wood is probably the cheapest and most common of gravity systems. The points to be considered in connection with this system are the limited pressure obtainable, the unsightliness and the difficulty of adequately and economically frost-proofing the tank and piping.

In conclusion, it should be said that the water-supply problem on the farm is one worthy of considerable thought from an engineering standpoint, and it is well for the farmer who contemplates such improvements to consult with the engineers of a reputable house engaged in the business before making up his mind as to the system best adapted to his needs.

ESSAYS.

(Especially prepared for the Sixty-first Annual Report.)

CANTALOUPE GROWING IN MASSACHUSETTS.

J. M. S. LEACH, SUNDERLAND, MASS.

Probably the melon does not strictly belong in New England, but in a hotter, more equable climate, with a longer season. Of necessity, therefore, we raise it under many difficulties, and seldom with a perfect degree of success.

But the fruit, when successfully grown, is so delicious in flavor, and so universally popular, that the effort to produce it, even under circumstances not entirely favorable, seems well worth while.

The wandering Israelites complained that they could not forget the melons of Egypt, and if they were good ones, it is hardly to be wondered at.

There are many influences that go into the making of a crop of melons, many of them beyond the control of the grower. This bulletin is an effort to deal with those conditions that he can govern.

SOIL.

A light loam is generally preferred. Melons do best if they are planted on land which has been in clover or alfalfa sod the previous year, as the nitrogen of the decaying roots and stubble is very beneficial to the melons. There is no question that this one thing often makes the difference between a record crop and a poor one. Good crops, however, are grown on old land.

EARLY MELONS.

To escape the early frosts of fall is only a secondary reason for growing melons early in this latitude. The primary reasons are that the earliest of the melon crop is sold with less competition, so that sales are easier and prices better; and that marketing is well advanced before the dog-days, with their rains and "muggy" heat, set the ground to steaming, and in consequence the vines to blighting.

To get an early start one should get the seed in the ground as early as the late frosts will permit, and as soon as the ground is warm enough for germination. Some prefer to gain time by starting the plants under glass. This is at best a delicate operation and requires patience and study.

Many of the great melon growers of the Arkansas valley start them in cold-frames with success, and claim a hardier plant is grown than in a hotbed; but the writer, in several years' trial, has always encountered some difficulty in getting a good stand in cold-frames. Perhaps there is too much cloudy weather in our early spring for the beds to warm up sufficiently.

A hotbed, though more expensive, overcomes the difficulty, and if well handled insures a good germination and continuous growth. Such a hotbed requires 1½ or 2 feet of horse manure in the bottom, which should be put in, leveled and trodden enough to make a level floor for the receptacles in which the seeds are sown. Plant boxes or inverted turf may be used for these. We use some of both. With boxes, finely composted manure may be mixed with rich loam for filling. The manure may be screened through an inch-mesh screen made of old telephone wire. If preferred, manure may be put in the bottom of the boxes, pressed down, and the loam put on top. If the loam is sterilized with steam, the weed seeds will be killed, so that the necessity of weeding the beds may be obviated. The "damping off" fungus will also be destroyed, and the growth of the plants be greatly promoted by sterilizing. Success can, however, be attained without it. The boxes may be bought in the flat, and tacked together as used. These should be filled level full.

If turf is used, it is preferable to select in the fall the place where it is to be cut, spreading on a coat of stable manure to enrich it. The sod may be cut into 5 or 6 inch squares, about 5 inches thick, and laid soil up, on the manure of the hotbed. After all is ready the glass should be put in place for two or three days, to allow the bed to warm up, after which it is ready for the seed, provided that the soil has reached a uniform temperature of about 80°. The hotbed needs to be under the care of some one who will not forget it.

So long as the beds are kept moist, and until plants begin to come up, temperature running up to 120° will do no harm. When the plants are up, 100° is all right for the first ten days; after that a lower temperature will do.

These, of course, are daytime temperatures. Some loss of heat will cause them to go down more or less at night, perhaps to around 80°. Ventilation must never be forgotten. The need of it increases with the growth of the plants as it is necessary that they be well "hardened off" before transplanting, and also because all the plants in the bed may be destroyed by neglecting ventilation for even an hour on a hot, bright day.

The growth of the plants may of course be promoted by light applications of hen manure and acid phosphate, but care should be used to see that the bed gets air after this application, since escaping ammonia may do injury. Or the plants may be watered with a nitrate of soda solution.

Plants should be thinned to one or two in a box in order to get a stocky plant. The proper time to transplant is when the little vines have four leaves. Transplanting may be left until there are six leaves, but should never be done earlier than the four-leaf stage. Just before transplanting time the plants must be gradually hardened by leaving off the glass.

In setting, the bed is thoroughly wet down, after which the boxes or turfs are loaded on a wagon and taken to the field. They are placed in the furrow and the soil drawn around them with a hoe. In case boxes are used they are cut away as the cube of wet earth is placed in the ground. If the plants are hoed at once and frequently, watering is seldom necessary.

FIELD PLANTING.

Two things should be fixed in the mind with this system of planting. Since the early start of the crop is important, the soil should be put into the finest possible tilth for the seed, because such condition not only insures their early germination, but makes the plant food more available. Depth of planting should be determined somewhat by the condition of the soil, a light, dry soil and dry weather requiring deeper planting. If planted too deep they are slow in coming, and reach the surface in weakened condition; if too shallow, the seed will dry up. Perhaps 1½ inches is a fair depth for average conditions. Seed should be used liberally to allow for losses from insects.

Hills are generally placed 6 by 6 or 6 by 4 feet. Thin to two plants when cutworms and bugs are gone. Some seed in drills with a seed sower, thinning later to single plants 1 or 2 feet apart. Before the plants come up the soil sometimes gets baked on the surface of the hill, and needs to be loosened by the fingers, or by passing a garden rake lightly over it with a lifting motion.

The critical period in the entire life of the melon plant is the first fortnight after it comes up. It is the start of the race, and everything depends on the plant getting away without a handicap, for a cantaloupe vine never recovers from a setback.

To understand the importance of care at this stage it is necessary to notice the structure of the plant. Pull one up and you will see that you have the two-seed leaves with a tuft between where the true leaves are waiting to come out, while below the surface there is nothing but the stem tapering into one long, stringy root running straight down into the ground. Now keep this state of the plant in mind while you notice that for days all the plants in the hill seem at a standstill. What are they waiting for? Simply for their mouths! Pull up another plant now and you will see roots putting out laterally on all sides of the taproot. These are the feeders, and as they push out into your finely prepared soil on every hand watch the plants spring forward into life and growth; the first true leaf unfolds in a day. The vine is off with a rapid growth that must never be checked for a moment till its work is done.

But here is the important point. At this stage the plant needs a nurse. Nothing in these first few days must be allowed to trouble it, — neither the striped beetle that would sting its stem and sap its leaves, nor the wind that would wrench and twist its delicate stem, nor the heat and drought that would burn the soil and make it too dry for the infant feed roots to take their first taste of food and drink, and to reach out into the surrounding soil for the nourishment for which the tiny plant above ground is waiting.

Hoeing at this time will do more good than at any other in the life of the plants. It mulches them and protects their scant roots. The drawing of the soil up around the plants braces them against destructive winds, while working about the hills tends to scare away the striped beetle, which is very timid. The hoe must be used with great care, however, on account of the shallowness of the roots.

Fertilizing.

Barnyard manure seems to offer the best and safest means of feeding the melon plant. Variation in opinion as to the method of application is wide. Manuring in the hill is the most common practice, and under irrigation or elsewhere where there is plenty of water it is the most economical way. But if one's crop must suffer each summer from drought, that effect will undoubtedly be aggravated by a lot of coarse manure in the hill. This is especially clear when we recall that chemically all decaying is burning, differing only from the burning of fire in its slower action. Thus you create a little drought of your own under each hill, a wholly unnecessary provision in recent years in Massachusetts.

This drying-out process is augmented by the fact that the thick pad of manure tends to retard capillary movement of water from below. Therefore, if the manuring in the hill plan is to be followed, the manure should be thoroughly mixed with the soil. Considering our dry summers, the writer prefers scattering the manure along a furrow and working it into the soil with a spiked-toothed cultivator set as narrow as possible. We sometimes do this in the fall. Broadcasting the manure is certainly as good a way as any except that it takes so much manure.

It may be well to add that most of those who have experimented carefully recommend manuring in the hill; but we in the east must remember that the experiments were generally tried with irrigated vines, which is quite a different matter. The common fear that the vine will not get the full benefit of manure unless it is placed immediately at the hill is wrong. Get hold of a mature cantaloupe vine and work the main roots carefully out of the soil. You will find them longer than the vines. The writer has frequently dissected a root out of the ground between 4 and 5 feet long, without getting to the end of it. These feed roots reach everywhere, and on account of their length the melon vine can go farther than most plants in search of food. Locating the roots in this way will teach another lesson, which is that they are not far below the surface, and the cultivator must be set accordingly.

With chemical fertilizers experiments show interesting variations. Among the large growers in the irrigated sections of the west the use of such fertilizers in the hill has been attended with serious hazard, while under New England conditions the plan has often succeeded. But it must be thoroughly mixed with the soil or it is liable to burn the tender plants so that they seem to go back into the ground, or even fail to come up at all, the strong chemicals destroying the sprouting seed. A good way is to make a shallow furrow and scatter the fertilizer with a McWhorter sower, and then scratch it in with a light cultivator or some such tool.

The writer has used a mixture analyzing nitrogen 5 per cent, phosphoric acid 7 per cent, and potash 9 per cent, generally hand-mixed, as follows: —

	Pounds.
Sulphate potash (high grade),	360
Nitrate soda,	150
Sulphate ammonia,	100
High-grade tankage (9 to 10 per cent nitrogen and 4 to 6 per cent phosphoric acid),	580
Acid phosphate (16 per cent),	810
Total,	2,000

From 800 to 1,000 pounds of this mixture per acre should be applied.

CULTIVATION.

The importance of this subject is greatly underestimated. The grower who hoes his melons primarily to kill the weeds is a crude workman. The object should be to keep the soil stirred for a mulch, to keep fresh soil up around the plants, and to keep the soil fine to make its elements more available as food for the plants. The hand hoeing is very important. The dry, baked soil should first be drawn away from the plants, preferably by hand, and fresh, fine dirt drawn up around them with the hoe. The whole purpose of cultivation is, like fertilizing, to promote a continuous growth. As has been said, all cultivation should be shallow after growth is well started.

ENEMIES.

Cutworms, Bugs and Blight.

Especially following turf or a cover crop, unless it is plowed in the fall, cutworms are generally abundant and very destructive. In a small patch they may be dug out in the morning; on a larger scale they may be poisoned by a mixture of Paris green, molasses and bran, a teaspoonful dropped near the hill in the afternoon. When planting, the cutworms should be remembered and seed used rather abundantly.

The striped bugs trouble but a few days generally, but that at a critical time, when the plants are tender and young and must be protected. Land plaster or gypsum dusted over the hills will drive them away, so will ashes or dust; or a mixture may be made of these and a few drops of turpentine added. A hill is occasionally found infested with lice. This should be burned on sight, or else buried and the top of the soil under the hill scraped off and covered also. Save the ladybugs, as they feed on the lice.

Blight is to the melon vine what cholera is to the hog, — the one great enemy. It has, in its various forms, several different scientific names, perhaps unimportant here. The blight has practically driven melon growing out of New England. The scientists have given their best endeavor to the problem, and sometime they will solve it, if it can be solved. Meantime prevention must be studied, and the first step is to advance the crop as far as possible before the sultry weather of the dog-days. Insects are suspected of spreading the disease, and so should be eliminated. A steady, continuous growth should be maintained for the sake of the physical vigor of the plants. To frequent cultivation might be added a light application of nitrate of soda as the vine approaches maturity, the object being to drive the plant into the dangerous August weather with the thriftiest possible growth.

There are strains of melons called rust resistant. Their rust-resistant qualities vary under different conditions of climate and weather. On the whole, they represent an advance, but the time has not come to depend on them greatly in the east.

SPRAYING.

Some good results in cucumber growing have been achieved by spraying. With melons the success has not been as general; some report good, and some very indifferent, results. Variation in results is probably explained by the fact that sometimes the disease present is one susceptible to the effects of spraying and sometimes not, the bacterial wilt not generally yielding to such treatment as readily as downy mildew or anthracnose, if at all. Undoubtedly, also, the violence and rapidity of the attack vary and have their influence on the measure of success in spraying.

Under the usual circumstances melons should never follow melons in successive years. A rotation of three years, at least, is generally advisable, although one prominent grower states that he has raised melons eighteen years on the same field by sowing with rye after picking and plowing in the rye in the spring. He states that the eighteenth crop was better than the first.

Spraying must not be put off until nearly time for the blight to appear, but should be begun as a preventive measure as soon as the plants are well above the ground, and continued once in ten days or so till the fruit is safe or the vines past hope. Use Bordeaux. This will stain the fruit more or less, but that is not important.

One point in respect to spraying the writer has never seen mentioned in print, namely, its tendency to very slightly reduce the yield in the first of the season. The increase, however, in the latter part more than compensates for this early loss. The reason is that the covering of Bordeaux shades the leaf which requires sunlight, though this same effect seems to benefit potatoes, whose growth appears to be promoted by the shading.

Bees.

The writer considers a swarm or two of bees in the vicinity of the melon piece an advantage in pollenizing the blossoms. They tend to help the vines to make a larger setting of fruit, and to a more perfect condition of the melons.

Varieties.

This is a subject upon which much advice is offered, but its value is doubtful. No one can tell the prospective grower the variety that is best for him. The writer, living in the Connecticut valley, recommended certain tried varieties to a farmer in eastern Massachusetts, who proceeded to make a complete failure with them, but he went further and made just as complete a success with those that had not done well with us.

A person buying a very nice Rocky Ford cantaloupe will plant the seed because he reasons that like produces like, forgetting that the conditions have as much as the seed to do with the outcome. "That Rocky Ford melon was good, wasn't it?" "Yes." "Then why can't I grow one just like it?" "You can — in Colorado." Seed that produced a fine melon in the dry atmosphere and constant sunshine of a Colorado summer will often mold and develop deficient flavor in our more humid air. There will be exceptional cases, but that simply means that the grower happened to strike something that fitted his special conditions.

One great lesson that the eastern grower needs to learn is that the seed should be acclimated. Why is it that certain growers have won a great reputation for their product? They have adapted a melon to their soil.

Under Connecticut valley conditions the Emerald Gem is an extra early and very refined melon as to flavor, but it is not a good shipper or keeper. We raise it to supply trade till something else is ready. Next in this region may come the Extra Early Osage, or, if the market cares for them, some of the Gem type of melons, like Burrell's Gem. These are all yellow-fleshed melons. Green varieties may be selected if preferred. The beginner should try more than one kind and stick to it, and develop by selection a strain of his own perfectly adapted, if possible, to his conditions.

Hybridizing.

Just how far this subject is a legitimate subject of study and experiment to the average grower is a question. The process is interesting and occasionally profitable, but it draws on the most valuable asset the farmer has, — his own personal specialized attention. Sometimes a grower finds himself in possession of a variety that seems adapted to his locality and market, but lacks some one necessary quality which it may be worth while to try to supply by a cross with a melon that possesses it. Random crossing produces 99 inferior varieties to 1 valuable one.

In our own work our difficulty at first was to find a variety that combined flavor with standing-up quality in the market; and to this we sought to add a degree of hardihood that would carry the plant through to fall in healthy condition. In the former we feel satisfied with results. In the latter we have been only partially successful.

A peculiarity of certain vines, like the cucumber, is that they bear their stamens and pistils on different flowers. This is true of some varieties of cantaloupes, but not of others. Many melon vines produce perfect flowers, having many staminate blossoms in addition.

If it is desired to obtain something definite and known in a cross, the closed petals or corolla and stamens should be cut away from the flower just before the bloom opens, after which the flower may be covered again for a day. A small paper bag will do for this. At the end of this time it is in about the right condition to receive the pollen, which may be rubbed off on the pistil by touching it with the anthers of a freshly opened bloom. It should then be covered again for a few days.

In all such efforts the foundation melon should be selected for its flavor, and other qualities bred upon that foundation. In attaining the ends sought uniformity of size should always be considered. No plan of selling that sends to market various sizes jumbled together will ever give general satisfaction.

Picking Melons.

Roughly speaking, most cantaloupes start to loosen from the vine at the stem when ripening. Sometimes this is first detected by a drop or two of juice that oozes from the junction of the fruit and stem. Again the bottom of the cantaloupe, being on the ground, generally looks greenish white while the melon is unripe, but takes on a creamy tint approaching yellow, when ripe.

There is also, generally, a slight change in color discernible under the netting, the deep, dark green changing to an olive green. A little experience as a picker will soon obviate the necessity of any rules. A glance will tell one the stage of the fruit.

Marketing.

This is a weak spot in present-day agriculture. There are certain principles to consider and they classify themselves under two heads, — honesty and efficiency.

Honesty on the part of a melon grower is even more essential than with growers of other farm products, because the quality of the fruit does not appear until it is opened. The responsibility of seeing that his customers get good melons, therefore, rests wholly on the grower. The temptation is constant to let melons slip by the sorter that look passable, but contain nothing but disappointment to the buyer. This is both a foolish and unprofitable policy. The grower's name should go with the goods, and his name should mean quality. The goods should be so graded in respect to size as to facilitate selling, making pricing convenient. Three sizes are generally made, — Pony, Standard and Jumbo.

Goods should be marketed, as far as possible, to the same customers year after year, in order that the latter may learn to know and have confidence in the goods. When such custom has been established the grower should make it his business to take care of the buyer, and see that his needs are supplied regularly. The establishing of such mutual confidence and dependence is of equal importance to both parties.

The great but much neglected secret of marketing is to always recognize one's obligation to the buyer, to give him goods uniformly graded and priced, of absolutely dependable using quality, and to assume the obligation of seeing that his needs are always supplied.

The temptation to deliver unripe fruit and specimens of questionable quality, because prices are high and demand good, will never appeal for a moment to the grower who thinks; for he will realize that he is not merely selling goods, but building a market. There is only one place where inferior stock should be marketed, and that is the hog pasture.

That we have obstacles to melon growing in Massachusetts there can be no doubt; but half the failures would be successes if the grower made a study of the plant, its eccentricities and its needs.

CURRANTS.

BY PROF. U. P. HEDRICK, HORTICULTURIST OF THE NEW YORK STATE EXPERIMENT STATION, GENEVA, N. Y.

Currants ripen at a time of the year when other fruits are scarce, and therefore play an important part in fruit growing, both for home use and for the markets. Moreover, their sprightliness of flavor and healthfulness commend them for the home garden, while the fact that they can be picked and sold before fully ripe, and therefore bear shipment well and with but little waste, commends them for market purposes. The currant is a northern plant and refuses to grow in any but a cold climate. It stands well the lowest temperature reached in the United States, but is quickly injured by hot summer suns. In selecting a location for this fruit, then, even in northern latitudes, a cool, northern exposure is desirable. For small plantations the shade of trees or of buildings can often be utilized, while in commercial plantings high land may be made to offset low latitude.

SOILS.

The currant will bear fruit in almost any soil, but to produce profitable crops it should be planted in a cool, moist soil. Clay loams, or even a stiff loam, if well drained, meet well the soil requirement of the currant. The plant is a rank grower, and whatever the soil, it must be rich. Moreover, the roots do not extend far, and the food must therefore be close at hand. Stable manure is a most acceptable fertilizer, but should be applied the season previous to the setting of the plants, or in old plantations the application should be made in the fall or winter. Many currant growers maintain that muriate or sulphate of potash used at the rate of from

100 to 200 pounds per acre increases productiveness and adds quality to the fruit. Probably, however, the fertilizer requirements of the plant are best determined by individual experiments with potash, phosphoric acid and nitrogen.

PROPAGATION.

Since the currant is easily propagated, growers of this fruit can often raise their own plants advantageously, the process being as follows: as soon as the leaves fall in the autumn make hardwood cuttings varying in length from 6 to 10 inches. In dry climates and in light soils the longer length is preferable, while in moist and rich soils the shorter length will suffice. The cuttings may be put in the ground as soon as made or, and perhaps better, they should be tied in bundles and buried butt end up in moist sand until spring. When the planting season arrives, which should be as early as possible in the spring, the cuttings are set from 4 to 6 inches apart rather deeply in the soil, leaving one or two buds above the surface with the earth pressed firmly about the butts. If fall planting is preferred the cuttings are thought to root rather more quickly and better if packed in damp moss for a week or two before planting. Fall set cuttings must always be mulched during the winter. The cuttings will start in almost any soil, but do somewhat better in a rich, moist one. The following fall these cuttings should be set in nursery rows, the plants being 8 to 10 inches apart, and the rows 3 feet. Here they should be left one or two years and kept cultivated.

PLANTING.

Either one or two year old plants may be used in starting a plantation, but, all things considered, the two-year-old plants are the better. The commonest distance apart is 6 by 4 feet, though the tendency is to give greater distance in the row, which permits cultivation both ways. Since the plants form a comparatively permanent plantation the land should be well drained, and in the best possible tilth at setting time. The transplanting is quickly and cheaply done by marking both ways and plowing a deep furrow one way and then setting the plants at the intersection of furrow and mark. In all but very cold climates the planting can best be done in the fall, and if severity of climate makes it necessary to set in the spring the work should be done as early as possible. There are no difficulties about transplanting, but the usual precautions of trimming roots and tops and of firming the earth should be observed.

CULTURAL TREATMENT.

The currant fruits early and the plant makes its growth early; therefore, it is urgent that the cultivation be early, thorough and frequent to conserve moisture and set free plant food. All of the varieties of the currant are shallow rooted, and the cultivation must of necessity be shallow to prevent injury to the roots and for that reason plowing is impossible. In growing the currant for home use it is often convenient to mulch with straw or coarse stable manure in place of cultivating. In commercial plantations such mulching can seldom be made to give as good results as careful cultivation. In midsummer cultivation should cease and a cover crop be planted. Probably the best cover crop is one of clover or vetch in combination with oats or barley, to be sown in late July or early August; 12 or 15 pounds of clover seed to the acre and 20 or 25 pounds of vetch, sown with a half bushel of oats or barley, give proper proportions of seed.

PRUNING.

Left to themselves currant plants rapidly become thickets, to prevent which there must be yearly pruning, which consists for the most part in removing old canes and thinning out new ones. In the pruning encourage an upright growth or the bush form with several stems rather than a straggly habit with but few stems. From four to eight stems are desirable, depending upon soil and variety. Aim to keep a continuous supply of vigorous shoots coming on. In well-pruned plantations no wood over three years old should be found. In pruning keep in mind that the best fruit is borne at the base of the one-year-old shoots, and on one-year-old spurs on two and three-year-old wood. Vigorous shoots may occasionally be headed in, particularly if the plants be young, but heading in ought not to be often necessary. The plantation should be removed or renewed as soon as vigor wanes, which is usually at ten or twelve years, depending upon variety, soil and treatment.

Harvesting.

There are several essentials to harvesting currants for market purposes. Chief of these are that the fruit must be dry when picked, not too ripe but hard and firm, and that the clusters be intact. So picked the fruit stands shipment well even to distant markets, but if the items named be overlooked the product often quickly spoils even in sending to near-by markets. Of course the nearer the market the riper the fruit may be allowed to become. Fruit for jelly should not be fully ripe. For home use picking can be delayed until the fruit is quite ripe, and may often be kept on the plants until midsummer if the bushes be protected from birds by covering with netting. Currants are commonly marketed in quart baskets or in grape baskets. In the former case they are shipped in crates holding 16 or 32 quarts. The 8-pound grape basket is now preferred in many markets, and is the more convenient way of shipping, both for the producer and the buyer.

Profits.

Profits vary greatly, but year in and year out this fruit gives very good returns, though in many cases the market must be developed or vigorously sought for. While many plantations do not yield more than 50 bushels to the acre, crops of from 100 to 250 bushels per acre under good culture are not uncommon. Unfortunately, the price fluctuates rather more than for most other fruits, and the small local markets are usually supplied from home gardens. Canning and jelly factories use this fruit in large quantities, and commercial growers ought to know before planting that they have an outlet for the sale of a part of their crop for canning or jelly. A fair average of the price paid for currants at the factory would be 5 cents a pound.

PESTS.

The currant suffers from several pests of which the currant worm, familiar to all, is most troublesome. This worm is to be found throughout the eastern part of the United States in all plantations, and must be combated if a profitable crop is to be grown. Happily, it is easily poisoned with any of the arsenical sprays or, if it has been permitted to continue its depredations until near fruiting time, powdered hellebore at the rate of a teaspoonful to a gallon of water is an effective remedy. The currant borer is also a serious pest in many parts of the east. With a little experience infested canes can easily be told, and the pest can be controlled by cutting out and destroying such canes in early spring. The San José scale also attacks the currant, and may be given the same treatment as on other fruits. One of the oil sprays is better than lime and sulphur on currant bushes, as the scale sometimes gets on the branches below the ground, and so a spray is needed which will spread. In eastern Massachusetts the bushes must be watched for the eggs and nests of the brown-tail and gypsy moths. Both of these can be detected and destroyed in winter. These are the only pests requiring constant looking after, though several fungi infect the plants more or less in different localities and may need treatment with fungicides. Commercial plantations should be sprayed with fungicide and an arsenical as soon as the fruit begins to swell, and again with a fungicide immediately after the fruit has been picked.

VARIETIES.

The following list should be considered in selecting varieties for either home or market purposes. It includes the standard kinds and several new sorts which are well worth trying.

The Cherry is a standard sort, with large but short clusters produced in great abundance.

Diploma is comparatively new, but to be commended because of its vigorous, upright habit of growth and large, light red, semi-transparent berries.

Fay succeeds remarkably well in some locations, but fails in others. Its sprawling habit of growth is a defect.

Perfection is a comparatively new kind much above the average in flavor; vigorous, productive and of good habit of growth.

Red Cross is liked by some because of the mild flavor of its fruit and its lateness.

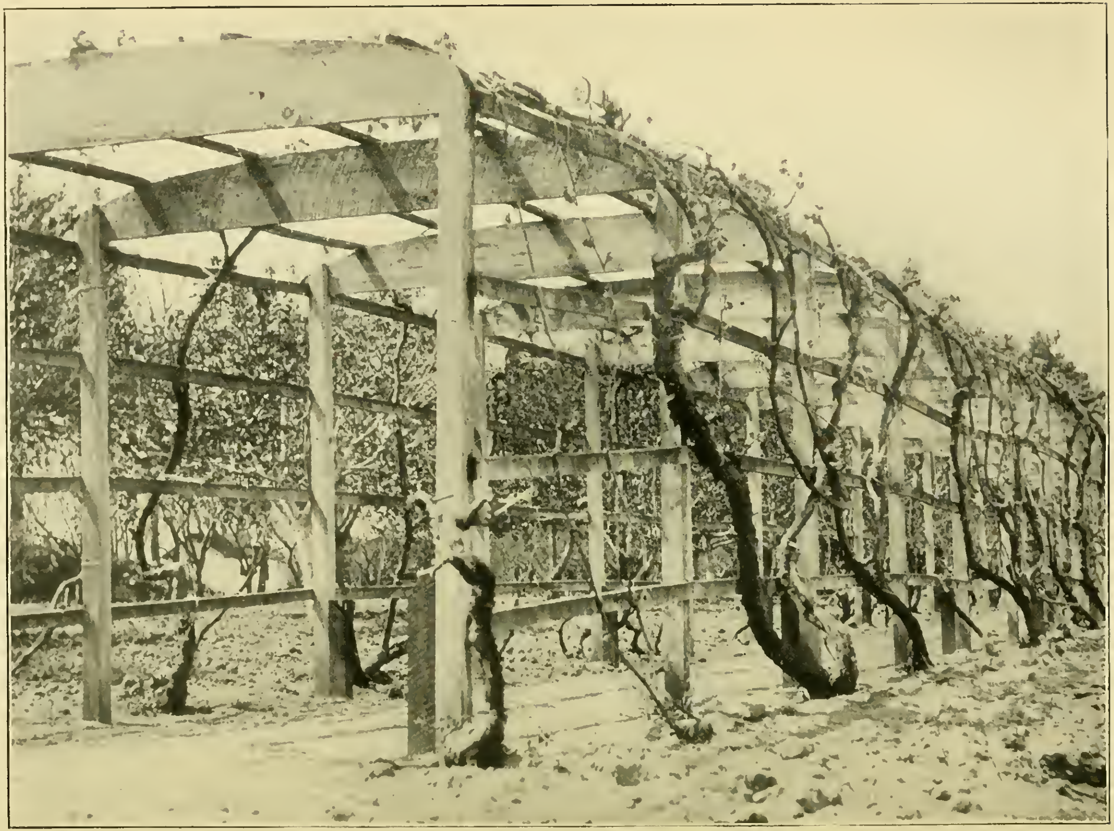
Red Dutch, an old sort with small fruit, is still prized by some.

Ruby is a mild-flavored variety very suitable for home use.

Wilder is one of the best late varieties; the bush is very vigorous, the fruit large and the season long.

All of the above are red currants. In some markets there is a demand for white sorts which are usually milder in flavor. Of the white varieties White Imperial is the most desirable because of its mild and very pleasant flavor. White Grape, however, produces larger and more attractive fruit than White Imperial.

Black currants belong to a different species than the red and white sorts, but thrive under essentially the same culture, demanding only a little more room. The fruit to those unaccustomed to it is not pleasant in either odor or flavor, but it is much esteemed by those who have learned its use, both as a dessert fruit and because of medicinal qualities. The strong musky flavor disappears in part if the currants be scalded for a few minutes in boiling water and then cooked in fresh water. Champion and Prince of Wales are by far the best of the several black currants.



Grape arbor at Fresno, California.

PRUNING THE GRAPE.

PROF. U. P. HEDRICK.

Why prune grapes? Grapes are pruned to prevent overbearing, to increase the size of bunch and berry, to maintain the vigor of the vines, and to keep them within proper bounds. A glance at the reasons for pruning shows that the operation has to do with the modification of the vigor and the fruitfulness of the plant, which is pruning proper, and with training, which aims to keep the vines in manageable size and shape. A man can care for his vines better if he keeps clearly in mind these quite distinct objects of pruning.

Whatever the method of pruning and training chosen, and as we shall see there are many, the grower must take in account the relationship of the wood to fruit-bearing. Grapes are produced on the base of the shoots of the same year, which in their turn spring from the canes of the preceding year. This important fact must be emphasized by an illustration. The average yield of a Concord grapevine is about 15 pounds; it requires from forty to sixty clusters of grapes to produce this quantity of fruit. As a shoot bears from two to three clusters, twenty to thirty buds must be left on the previous year's growth to furnish the required number of clusters. Therefore two, three or more canes are selected and are variously distributed on one or two main stems in accordance with the system of pruning. Good pruning, then, means removing all wood except canes or spurs sufficient to furnish the shoots necessary to produce the desired number of clusters of grapes.

Terms defined.

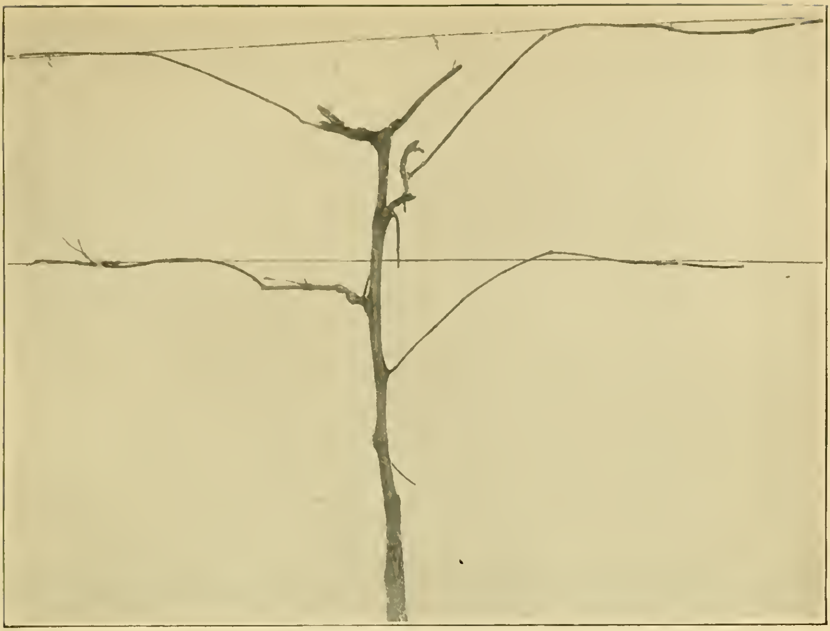
Before going further we must define several terms. The *trunk* is the body of the vine when two or more years old. An *arm* is a branch from the trunk, two or more years old. A *cane* is a one-year-old branch of the arm or trunk. A *spur* is a very short but annually lengthening arm from which cane renewals are made. A *shoot* is the growing, leafy branch of the current season.

Systems of Pruning.

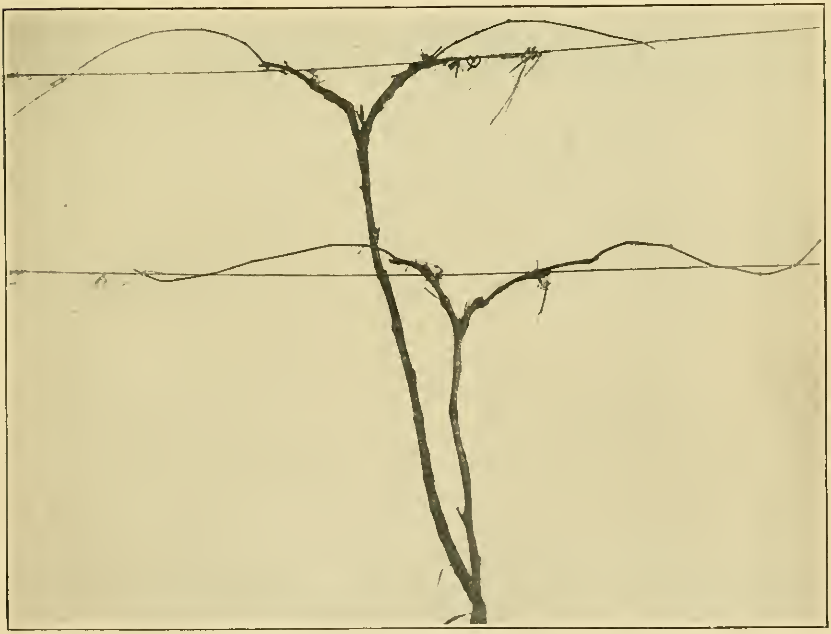
Grape growers designate distinct methods of pruning as "systems," of which there are a score or more, only a few of which need be described in this article. Before taking up the several systems it must be said that pruning to maintain vigor and promote fruitfulness is more essential than training in any particular way, though there necessarily exists a close relationship between pruning and training. Usually, it is true, a vineyard should be pruned and trained in accordance with one of the named systems, but very often lack of vigor in the vine will not permit the pruning necessary to train all vines in the vineyard in the desired way. Thus, in pruning and training the operator must be able to exercise good judgment. The vineyardist must decide how much pruning each individual vine in his vineyard is to receive, and according to what system his whole vineyard can be trained to the best advantage. When the vines are vigorous the system of training is largely optional with the grower, but if they lack vigor one is often forced to adopt a system which he might not otherwise choose. For example, strong-growing varieties, like Concord and Niagara, do best trained with the shoots drooping; whereas weak-growing sorts, as Delaware, are usually best trained with shoots upright.

Drooping System.

We come now to the discussion of the several systems, and may as well take up first those in which the shoots are allowed to droop and hang free, the drooping systems, which



Single-stem Kniffen system.



Two-stem Kniffen system.

have the advantage of being more economical, as no summer tying is necessary. A man named Kniffen was the originator of this method of training grapes, and his name is perpetuated in all of its many modifications now to be described.

Single-stem, Four-cane Kniffen System.

In this method of training, a single trunk is carried to the top wire of the trellis. This can be done in most vineyards the second or third year after setting. The top wire is at an average height of 5½ feet above the ground, the lower wire 2 feet lower. Four canes are taken from side spurs on the trunk and laid to right and left on each wire. The upper canes should be longer than the lower ones, as the vines are most vigorous at the extremity of the stem. The trunk is permanently tied to each wire. Pruning, then, consists of cutting out all but four of the canes that have developed from the canes of previous years, selecting the most vigorous and those that are closest to the main trunk, cutting them back to five or six buds and again tying up. Probably this is, the country over, the most generally used method of training grapes, its simplicity commending it in particular to the novice.

Two-stem, Four-cane Kniffen System.

This system is very similar to the one just described, the difference being that two permanent trunks are brought up from the ground, one to the lower wire and the other to the top wire, with two canes taken off from each. In using the two-stem method the canes taken off from each trunk may have the same number of buds, the two trunks being considered as distinct vines. This system is supposed to be particularly well adapted to strong-growing varieties on fertile soils.

Y-stem Kniffen System.

The Y-stem differs from the two-stem in that instead of the two stems being brought up from the ground, a branch is taken from the main stem a little below the lower wire from whence it is carried to the top wire and tied. The number of canes laid down and the subsequent treatment are the same as in the other systems so far described. This method, too, is used when vines are vigorous and the soil rich.

Umbrella Kniffen System.

In the umbrella Kniffen system two canes are used instead of four, each having from eight to twenty buds. The canes are taken from spurs on the trunk at the top wire. They are then tied to right and left for a distance along the upper wire after which they are bent down to the lower wire and secured. The clusters of grapes are supposed to be better protected from heat and sunscald by the umbrella method of training, and the method is used, therefore, in warm climates and with tender varieties in cold climates.

One-wire Kniffen System.

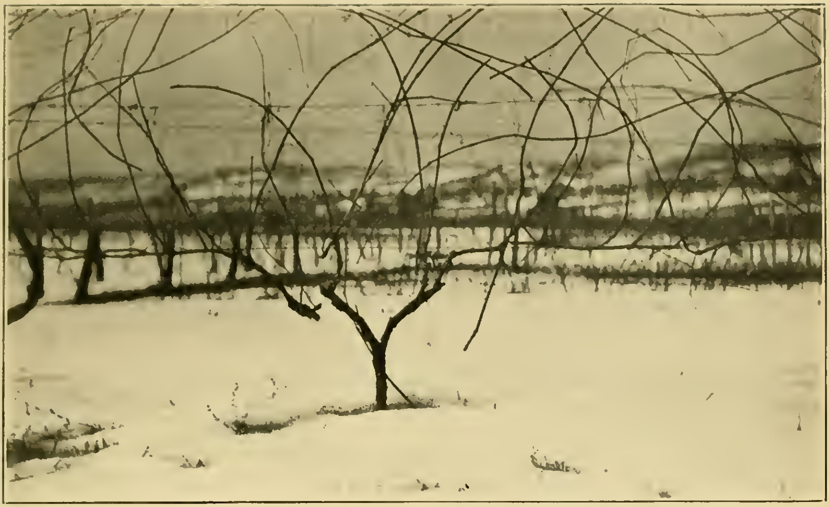
The one-wire Kniffen is a modification of the umbrella method, but differs in that the trellis has but one wire about 4 feet above the ground. The trunk is fastened to the wire and two canes of from ten to twelve buds are taken off and laid to right and left of the stem. The cheapness of the trellis commends this system to some growers.

Upright Systems.

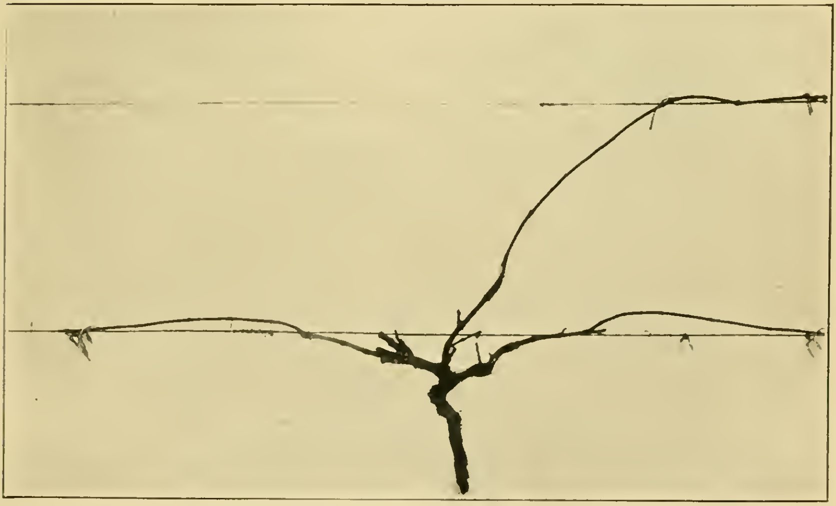
The upright systems are those in which two or more canes or arms are carried horizontally along the wires or obliquely across them, and the shoots as they develop are tied to wires above. Several upright systems, each with distinctive merits, are in vogue with grape growers.

The High Renewal System.

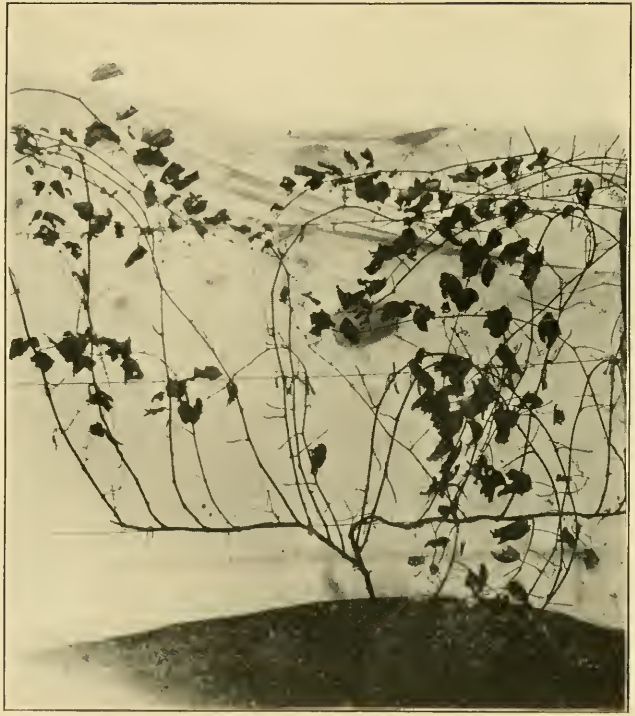
In this system the trellis is made with two or more, usually three, wires. The lower wire is placed from 18 to 30 inches above the ground, while the second and third wires are 20 inches apart. The trunk of the vine is carried to the first wire, and two canes each with from six to ten buds are taken off to right and left a little below the wire. The shoots that grow from the buds on these canes are tied to



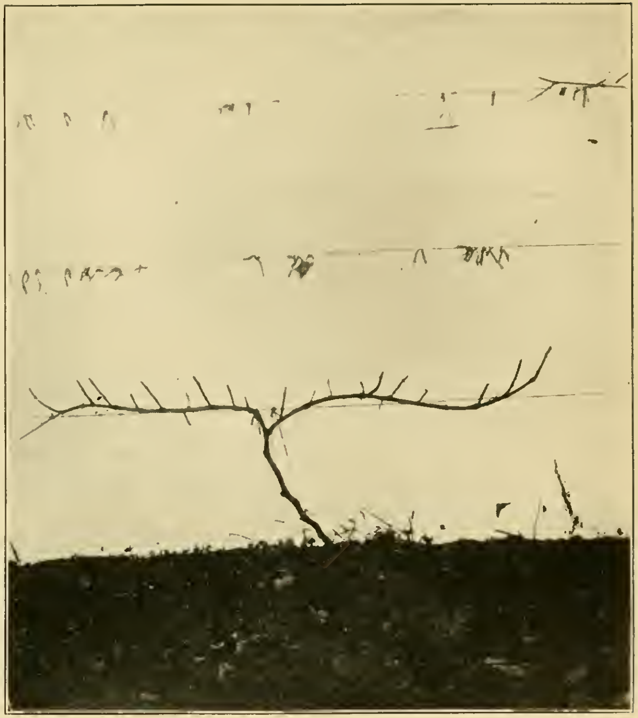
High-renewal system. Pruned but not stripped.



High-renewal system. Pruned and stripped.



Horizontal-arm spur system, — before pruning.



Horizontal-arm spur system, — after pruning.

the second wire and then to the third, as growth permits. Near the base of the canes, but upon older wood at the head of the stem, short spurs carrying two or three buds are maintained from which shoots develop to furnish the fruiting canes of the following year. In this method the amount of old wood retained is reduced to a minimum, but the labor of tying is greatly increased. Large quantity and high quality of fruit commend the method.

Spur Renewal; Horizontal-arm Spur System.

The trellis for this system is practically the same as for the high renewal. Two canes are laid down to right and left, as in the high renewal, but in this system these canes become permanent arms and do service for several years. The shoots that develop from buds on these canes the current year are cut back to two buds. Two shoots are allowed to go from each of these spurs and are tied to the upper wires. In the fall the cane developed from the upper bud of the spur is cut away and the other canes cut to two buds as before. At the beginning of the next season we have, as in the previous year, two shoots springing from a spur on these permanent arms. The spurs lengthen rapidly and become crooked, making it necessary to cut them away every few years and to grow others from shoots that arise on the arms. The spurs are developed from 5 to 20 inches apart. Formerly a favorite method of training, the "spur renewal" is now passing from practice.

Spur Renewal; Chautauqua System.

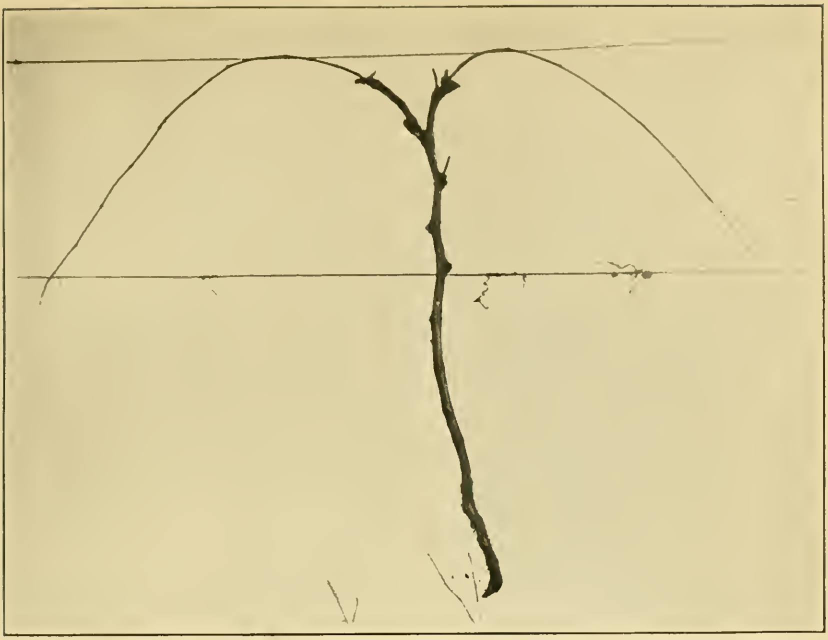
This system is a modification of the one just described much used in the great Chautauqua Belt in western New York. Permanent arms are used to support the shoots which, as they grow, are tied to the two or three wire trellis. The shoots may be tied obliquely or perpendicularly. If two wires are used they are placed about 34 inches apart; if three, about 20 inches apart. The canes for tying up the following year either develop directly from the old wood or arise from spurs on the arms, or from the best buds of the past season's canes. The old arms should be renewed at frequent intervals. Possibly the Concord and Niagara, under average conditions, are best trained either in this way or in the four-cane Kniffen system.

Arbors and Bowers.

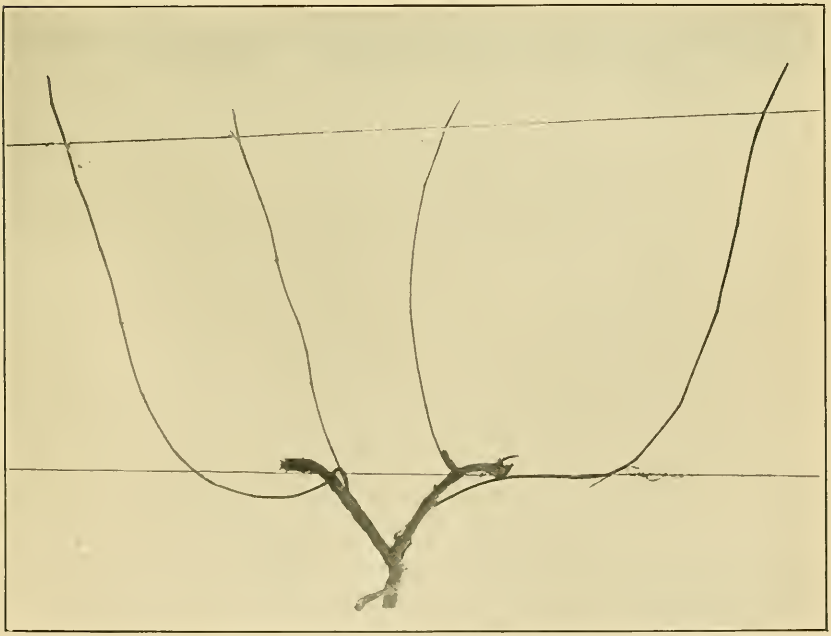
But little skill is needed to train grapes as coverings for arbors and bowers. The permanent trunks are carried to the top or center of the arbor. From these trunks canes are laid out from year to year at intervals of about 24 inches, a feat possible only by leaving spurs for renewal. The vines should stand from 6 to 10 feet apart, and the canes are cut at half the distance between the vines, meeting in the middle of the dividing space. Shoots springing from these canes cover the arbor. The object in this sort of training is to secure shade, and it is not to be expected that fine grapes can be so grown, but if the vines are severely cut back from year to year, grapes of very fair quality and in considerable quantity may be produced.

Pruning Neglected Vines.

Many times it becomes desirable to prune neglected vines. Occasionally one finds a vineyard several years old that has never been pruned. In either case such vines can seldom be made over advantageously. If they are healthy and vigorous the best thing to do is to grow a new vine from a cane taken out from the root. The old trunk in such a case is allowed to remain until the new one is strong enough to be tied to the wires. To encourage the production of a new cane from the roots, and to induce vigorous growth in the new trunk, the old vine should be heavily cut back. If the new cane is exceptionally strong it can be tied to the wires at the end of the first season. More often it should be cut back in the winter to about three buds, from one of which the permanent trunk can be grown the second season. The new trunk is tied as if it were a young vine. Suckers are bound to arise under such treatment, and these should be removed frequently.



Umbrella Kniffen system.



Chautauqua system.

Time to prune.

Grapes may be pruned from the dropping of the leaves in the fall to the swelling of the buds in the spring. Pruning after sap begins to flow is devitalizing. It is seldom advisable to prune when vines are frozen, as the brittle canes are easily broken during handling.

Summer pruning is far less practiced now than formerly, with a tendency to do less and less of it. It is used to remove surplus shoots and in heading back canes to keep them within limits. Very often shoots grow from weak buds on the fruiting canes to the detriment of the fruit-bearing shoots. These weaklings should be rubbed off. So, too, shoots often break from arms, spurs or even the trunk where they are not wanted. These should be removed. Secondary shoots sometimes appear on fruiting shoots, especially in the axils of the latter; these should be rubbed off. Here, for the most part, summer pruning should end.

Tying.

Tying the canes and shoots to the trellis is a task requiring quickness, skill and good judgment. Canes are tied before buds swell in the spring, and the shoots must be tied during the summer. The materials used in tying are various, such as raffia, wool twine, wire, willow, carpet rags, green rye straw, corn husks and bass wood bark. The canes should be tied to the windward side of the wire, and this tie is now almost always made with a No. 18 gauge, annealed wire about 4 inches in length. The tie is a double loop about wire and cane made by the workman standing on the opposite side of the wire from the cane. The wire should be soft, but even then the work must be done with mittens or gloves. The cane is bound snugly to the trellis that there may be no chafing. Shoots are best tied with raffia or wool twine, the tie being made very loosely to permit growth in the diameter of the shoot.

Odds and Ends of Pruning.

Grapes are best pruned with small, light, specially made pruning shears. Usually the canes are allowed to remain tied to the wires or stakes until the pruning is done, though in the Kniffen systems the strings may be cut. The work of pruning is best done by a skilled man who only makes the cuts or "blocks out." After the vineyard is "blocked out" the wires must be stripped. Stripping is usually done by unskilled labor. The prunings are hauled from the vineyard by a horse attached to any one of several devices, probably the best of which is a pole a little smaller than the pole used to bind a load of hay. A horse is hitched to the pole by means of a rope drawn through a hole about 4 feet from the large end of the pole. The small end is held in the hand as the butt is pulled along the ground. After the first vines are caught, the rest of the brush clings to the wood until a load is secured. Stripping and hauling must be done before the buds swell in the spring, otherwise many young buds will be broken off by pruned vines.

The Trellis.

Posts for the trellis are best made of chestnut or locust. They should be from 6 to 8 feet in length, reserving the heaviest for end posts. One post to every three vines is sufficient. The end posts are driven to a depth of from 22 to 23 inches and braced by a 2 by 4 or 4 by 4, notched to fit the post half-way from the ground to the top and standing obliquely to the ground where it is held by a 4 by 4 stake. Posts other than those at the end can if properly sharpened be driven into holes made with a crowbar. The best wire for the trellis is No. 9 or No. 10, the number and height of wires depending upon the vigor of the vines and the system of training. The wire is best secured to the end post by winding it once around the post and then around itself several times. Ordinary fence staples suffice to hold the wires on the posts, enough space being left in the staple to permit loosening and tightening.

NUT CULTURE FOR MASSACHUSETTS.

MR. WILLIAM C. DEMING.

It is within the range of sane belief that, had the nut tree been as easy of propagation as the apple or peach, the hills of New England would now hold as many orchards of nut trees as of the other fruits. The best specimens of our native nuts would have been selected, grafted and sold by nurserymen. Foreign nuts would have been introduced, and acclimated varieties of the Persian and other walnuts, almonds and filberts developed.

At first thought it seems strange that this has not already been done, but a little reflection will disclose the reasons. To hundreds of men has occurred the idea of growing nuts. The natural thing would be to plant the nuts themselves, choosing fine types and planting the best. The results were always disappointing. Filberts grew well but died off about the time they were beginning to bear. Almonds either died from the effects of climate, or did not bear, or what they bore was of little value. The shagbark, butternut and black walnut grew slowly because never given cultivation or fertilization, rarely bore before they were fifteen years old, often not until they were twenty-five, some bore little or nothing, and of those that did bear freely the nuts were almost always inferior to the planted nuts. The same remarks apply to the pecan, except that in the north few trees, raised as they almost all were from Texas or Louisiana nuts, could stand the climate, and those that did either bore no nuts, or those they bore did not fill or were too small to be of any value. The "English" walnut has been often planted, and while a few trees have survived and are the source of our great expectations for this nut, most of them did not live or, if they did, either did not bear at all or bore an inferior nut after long years of waiting.

The chestnut alone has been developed to a large degree, due chiefly to the comparative ease of propagation, and was our only nut certainty, until the blight came and put a halt to progress in this direction.

Of course it occurred to some to try to bud or graft from choice native trees on native seedlings. But this was almost invariably a failure, as great refinement of technique is necessary for success in propagating most of the nut trees. The chestnut, almond and filbert are easier of propagation, but these have all been interfered with by the causes mentioned.

For these and for other reasons it has been slow work reaching the point which we believe we now have reached, where we can make rapid progress in nut growing, due chiefly to our acquirement of the art of budding and grafting all the nut trees.

Not all the problems are yet solved, but we think that we can see the way to solve them, though we have not yet advanced so far that we can advise commercial planting. We are still in the experimental stage, and except for a number of chestnut orchards, mostly in New Jersey and Pennsylvania, and an orchard of about 225 seedling walnut trees in northern New York, there are no bearing, commercial orchards of nut trees in the north.

The success of the pecan in the south, and of the almond and walnut on the Pacific coast, the growing number of persons able to live in the country, or to have country places, and the consequent increasing interest in the accompaniments of country life, together with the activities of an enlarging group of individuals and societies, farseeing enough to foretell the future great importance of nuts, — all have contributed to cause an interest in nut growing that is spreading rapidly.

With our growing population and the increasing restriction of our great cattle ranges, the consequent diminishing meat supply and increase in its cost active minds are looking elsewhere for our supply of the important, musclebuilding, energy-yielding, expensive protein element of our food.

This will be supplied chiefly from such sources as cheese, dried fish, the legumes, the hen and nuts. We shall grow nut trees, not too close together, between them beans and alfalfa, keep some chickens and a cow, and be forever independent of the butcher, even if we do have to send to the grocer for an occasional codfish for our Sunday morning fish cakes. We can predict the day when it will be possible to send to the grocer's, not the butcher's, for a nut chop or steak. Thus the distasteful associations, and possible dangers, of butcher's meat may be easily done away with if we choose.

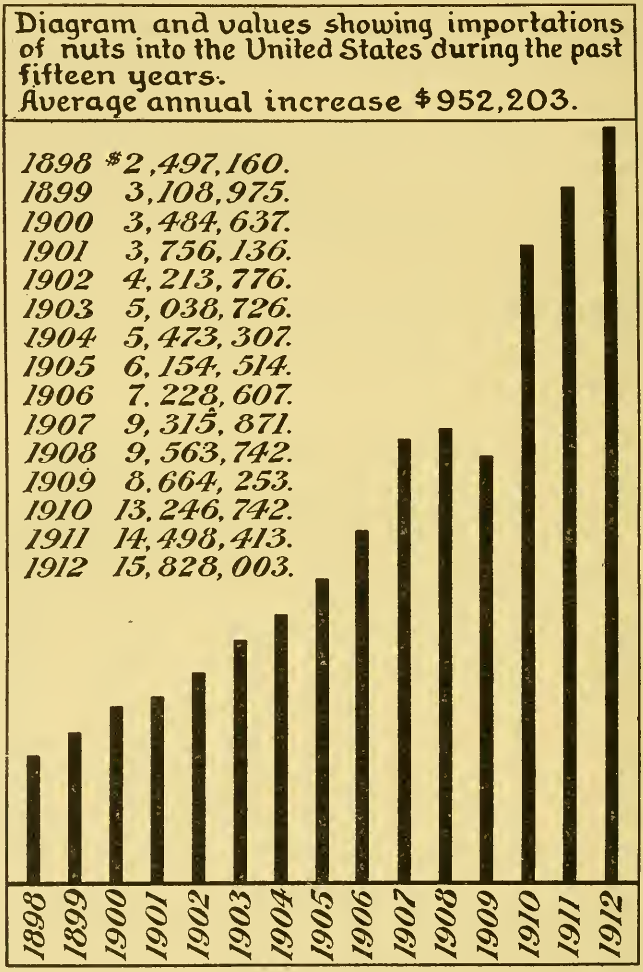
The following table shows how nuts rank, in comparison with some other articles of diet, as suppliers of protein, fat and starch.

Food Value of Nuts, and of Other Foods for Comparison.

Nuts.

	Protein.	Fat.	Sugar, Starch, etc.	Fuel Value per Pound (Calories).
Almond,	21.4	54.4	13.8	2,895
Beechnut,	21.8	49.9	18.0	2,740
Brazil nut,	17.4	65.0	5.7	3,120
Butternut,	27.9	61.2	3.4	3,370
Chestnut, dry,	10.7	7.8	70.1	1,840
Cocoanut,	6.6	56.2	13.7	2,805
Filbert,	16.5	64.0	11.7	3,100
Hickory nut,	15.4	67.4	11.4	3,345
Peanut,	29.8	43.5	14.7	2,610
Pecan,	12.1	70.7	8.5	3,300
Pine nut,	33.9	48.2	6.5	2,710
Pistachio,	22.6	54.5	15.6	3,250
Walnut,	18.2	60.7	13.7	3,075
Other Foods.				
Beef steak,	19.8	13.6	–	950
Cheese, Cheddar,	27.7	36.8	4.1	2,145
Eggs, boiled,	12.4	10.7	–	680
Wheat flour,	11.4	1.0	74.8	1,650
Beans, dried,	22.5	1.8	55.2	1,605
Potatoes,	2.2	.1	18.0	385
Apples,	.4	.5	13.0	290
Raisins,	2.6	3.3	73.6	1,605

From this table it may be seen that butternuts contain about 28 per cent of protein, or the same as Cheddar cheese, and a third more than beefsteak. Pecans contain over 70 per cent of fat, or twice as much as the cheese and more than five times that of the beefsteak and nearly seven times as much as eggs. Chestnuts contain 70 per cent of starch, or nearly as much as high-grade wheat flour and four times as much as potatoes. One can see that something more can be made of nuts than a relish or a dessert.



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The importance of nuts as food is further shown by the importation of nuts and nut products into the United States, and the rapid increase in the value of the importations.

Further evidence of the importance of nut growing may be found in the extent of their cultivation and use in Europe and other continents. The walnut trees on many farms in southern France determine its rental value and form a chief source of income to the tenant. In parts of France, Italy and other countries chestnuts furnish flour for bread for man, and chestnuts and acorns furnish forage for animals. Prof. J. Russell Smith relates that when he stopped at the house of the mayor of a little town in Corsica the mayor went to a bin and brought out a measure of chestnuts to feed the horse.

In Mediterranean countries the almond is an important crop for home use and export.

In our own country the walnut, almond and filbert on the Pacific coast are becoming industries of national value. In 1912 they produced 3,000 tons of almonds and 11,250 tons of walnuts.

In the south the development of the pecan, and of the pecan industry, is one of the wonders of horticulture. Barely twelve years ago the propagation of the pecan was practically unknown, and seedling trees the sole dependence. Now thousands of acres are occupied with tens of thousands of trees, grafted or budded from selected wild trees. These wonderful pecans, that hardly any of us northerners have ever seen, so different from the grocery store pecan, and that fetch up to 50 cents or more a pound in the home markets of the south, are not artificial hybrids, the result of man's scientific work, but nature's own product which has been merely propagated and perpetuated by the art of man. The same process is awaited by the native nuts of the north. The walnut growers of the Pacific coast and the pecan growers of the south have shown us the way.

The entire success of nut growing depends on the art of propagation. To get trees bearing true to type, and as early as the apple, we must set grafted or budded trees, just as with the apple. No one should think of setting an orchard of seedling nuts any more than an orchard of seedling apples or peaches. Of course the development of new varieties must come from raising seedling trees by planting nuts.

One in many of these seedling trees will be notably superior. On this account the growing of seedlings from hybrid or selected nuts must be practiced by those who have the opportunity, but the perpetuation of superior nuts, secured in this way, or found in nature, cannot be accomplished by planting nuts, but only by a sexual propagation. Consequently, the man who wants to grow good nuts, and only good nuts, must either plant budded and grafted trees or graft and bud his own seedlings.

Success in grafting and budding the walnuts and hickories can be attained only by expert knowledge, hired or laboriously acquired. The other nuts are mostly fairly easy of propagation by the usual methods.

Government and other bulletins may be had that teach by word and diagram the methods of propagation. But an easier and surer way to learn is to practice under the eye of an expert.

Beginning with nut culture should not be delayed, however, until one has learned the art of propagation. Nuts should be planted, and budded or grafted trees, to be obtained now from special nut nurserymen, should be set, and the methods of propagation may be practiced and learned while the nuts are growing to furnish stocks and the costly trees to furnish scions.

Top working native walnuts and hickories to improved varieties is a promising, though hardly demonstrated, possibility.

It is the habit of the walnuts and hickories to send a taproot down until it reaches permanent water. A tree that, from any cause, is prevented from doing this will not attain its perfect development nor reach the allotted span of its existence. To get the most perfect development of such a tree Mr. J. C. Cooper suggests, as an illustration, that an old well be filled with rubbish and good soil and the tree planted over that.

Nurserymen's instructions for setting and after care should be carefully followed. The first two or three years are critical times with these taprooted trees, rudely torn from their half-accomplished purpose of fighting their way through the hard earth to permanent water. They must be visited almost daily at critical periods, and treated with all the refinements of horticulture that can be mastered, but above all given plenty of deeply placed water when droughts are upon them and winter protection until well established.

Soil and climate requirements are not fully known. Comments about these will be made under the individual nuts, and in the course of the general remarks.

Planting nut trees about the house and barns may be recommended, as such locations are usually fertile, bushes and weeds would not be present, daily observation would be more likely, and most nut trees are desirable for shade and ornament.

Fence corner planting is not to be recommended, since the trees generally have to compete with native and adapted weeds, bushes or trees, and they are out of sight and mind.

Roadside planting has had advocates, but is usually undesirable, as it would be for fruit trees in general, on account of the reasons given above and because of the depredations of man and his straying animals. Some day, when the whole country is a garden, and the government the gardener as in some foreign countries, such planting may be advantageous.

For the man whose nut-growing tastes are scientific the creation of new kinds of nuts by cross fertilizing offers a field unexcelled in horticulture. The walnuts cross so freely with one another, as also do the hickories, and even some hickories with walnuts, that the possibilities seem endless. Results have already been attained in breeding fine chestnuts, immune to blight, by crossing the American chinkapin and the Japanese chestnut. This work ought to be much more extensively taken up by experiment stations and private individuals.

The literature in this country on nut growing is fairly comprehensive, except that the only systematic works on the subject are not up to date. Every one interested, however, should read " The Nut Culturist," by Andrew S. Fuller, the

Orange Judd Company, New York, 1906, for its information, the charm of its style and the enthusiasm of the author.

"Nut Culture in the United States," United States Department of Agriculture, 1896, should also be read. but is out of print and scarce.

The government publishes separate bulletins on the pecan, walnut and other nuts, their food value, diseases, etc., and most of the States where the pecan and walnut are grown have issued bulletins on these nuts. Most of these, and other nut literature, are listed in a circular of the Northern Nut Growers Association, sent free on application to the secretary, and the annual reports of this association contain papers and discussions on different phases of nut growing.

CAN NUTS BE GROWN IN NEW ENGLAND?

Of course every one knows that a great quantity of nuts is already grown in New England, but every one also knows that most of them grow where nature planted them. What we want to know is whether we can grow nuts that will be greatly superior to the wild nuts, — the ordinary run, — and whether we can grow them in quantity for our own use or for commercial purposes.

The answer will come under the following two heads: —

1. *The Development of Our Native Nuts.*

The pecan in the south shows us what can be done. It is just as possible with our own native nuts. Far off in the fields and forests there is many an old nut tree that bears a nut worth growing; there must be some that are better than most of us have ever seen. Year by year these are passing away and, with our diminishing forests, they are not being replaced by nature. We now know how to propagate nut trees. It is therefore the duty of every one who cares anything about such things to make known to some authority any tree whose nuts he thinks sufficiently valuable that it may be propagated. If it is any incentive to such an act, it is safe to promise that the nut, if worthy of perpetuation, will be given the name of the person who first makes it known. There are as yet not a half dozen northern nuts, excluding the chestnut, that are being commercially propagated. Practically, there is but a single nut, the Hales hickory, and that is sold in very limited numbers.

2. *The Introduction of Alien Nuts.*

This part of the subject had best be taken up under the head of the individual varieties.

Let us consider first, and for the sake of completeness, those nuts about which there is the least to say.

The Pistachio. — This is being tried by experimenters. The following remarks about the almond will apply, in a general way, to this nut. At present we know too little about it to say more.

The Almond. — The finer varieties of this valuable nut are being grown very profitably on the Pacific slope. It appears to be well demonstrated that the so-called soft-shelled almonds are either too tender in wood to stand our climate, or they bloom so early in spring that they are caught by late frosts. It seems also to be a fact that the hard-shelled almond is quite hardy and bears fruit even in New England. It has been asserted that the fruit of the hard-shelled almond is not valuable, while others say it is as good as the soft-shelled, the only difference being in the shells. Bulletin No. 26, Bureau of Plant Industry, United States Department of Agriculture, 1902, page 7 says, "The most valuable almonds of commerce are those grown in southeastern Spain. They are hard-shelled varieties. . . ."

It would seem as though the almond ought to grow wherever the peach will, being of that family, or that it could be trained to do so. There appear to be no records of attempts to breed hardy varieties, and this apparently offers a good field for experiment. Large numbers of seedlings should be grown from seeds of choice varieties, brought from their northern limits, perhaps from Oregon or Washington in this country, or from Europe. Variation in the resulting seedlings should give us, in time, the wished-for adapted varieties.

Good authorities consider the almond worth growing for its beautiful flowers alone.

The Pine Nuts. — In many parts of the world the edible seeds of various species of pine are more or less used for food. They sometimes come on the market as *Pinolas* or *Piñon* nuts. In the Andes mountains is a pine that bears very large nuts or seeds. Many of the edible seeded pines are hardy and offer a good field for experiment.

The Beech. — Experts believe that this splendid tree is worthy of trial and experiment as a nut-producing tree. The nut is familiar to us all. If one could be found that was of some size it would be of value. In many localities the nuts do not fill. It should be grown on rocky hillsides and other places unfit for cultivation, to furnish mast for the fattening of hogs.

The Oak. — As a mast producer the oak probably ranks before the beech. There are varieties bearing nuts sweet enough to be edible by man. It seems as if a way should be found of utilizing, in this country as in foreign countries, the very abundant fruit of this great, hardy and long-lived tree. It is very suitable for reforesting rocky slopes to furnish mast for swine, and for its timber. More attention should be given to growing the beech, oak and chestnut as forage producers for feeding animals. J. Russell Smith says, "Approximately nine-tenths of the proceeds of American agriculture go to nourish the quadruped, and man eats the remaining one-tenth."

The Chestnut. — This is the great tragedy of nut growing. The chestnut is culturally the highest developed of our native nuts. A number of men have crossed our native chestnuts and various foreign ones and produced varieties of ample size and excellent quality, bearing young and abundantly. Commercial orchards have been established in a number of places, and many smaller ones for home use, and many of these were bearing profitably. The chestnut industry appeared to be on an established basis, but a few years ago the chestnut blight appeared and has upset the equilibrium of the situation. The disease is now found from Maine to the Carolinas, and even on the Pacific coast. Where it first began it has killed every tree. It seems to be gradually doing the same wherever it is present. It is true that in some of the older cultivated commercial orchards the claims of the owners, that they can keep the blight under control by constant watchfulness and inspection of the trees with control measures, seem to be borne out. But it looks as if our native trees were doomed.

A bright ray of hope for the cultivation of chestnuts has been shed by the experiments of Dr. Van Fleet of the United States Department of Agriculture. It is now accepted that the chestnut blight was imported from the Orient where it is found endemic. The Oriental chestnuts have more or less immunity. So has our native chinkapin. Dr. Van Fleet has crossed the chinkapin with the Japanese chestnut and got resulting hybrids combining the size of the Japanese and the high quality of the chinkapin, at the same time securing great, perhaps complete, immunity from the blight. Moreover, these chestnuts bear very young and annually, some bearing in less than two years from the seed, and some of them several pounds of nuts in their third year. These nuts are not yet available for distribution, but persons who are interested should consult the "Journal of Heredity" for January, 1914, where Dr. Van Fleet describes his experiments and results with illustrations. This number also contains two illustrated articles on the chestnut blight.

Recommendations for the chestnut in New England at present are to try them in very limited numbers, giving them good care to promote vigorous growth, and watching them to discover the earliest evidences of the blight, which should be treated as the pear blight would be. Unless they can be given this careful attention it would be better not to set them at all.

There are no immune varieties of the American chestnut. Among the best of those we have are the Rochester, Boone and Paragon, which may be bought of several reliable nurserymen. The Japanese varieties are generally coarse and not of good quality, though there are said to be superior ones. The Japanese chestnuts grow rapidly, bear young and are beautiful, and useful as screens or in masses.

Many cases of severe illness, and several deaths, have been attributed to eating chestnuts from blighted trees, and until official verification or refutation of such assertion is obtained it would be better to abstain from eating chestnuts from trees affected by the blight, and even from those growing in regions where the blight is present, even though the particular tree may show no evidences of it.

The Filbert. — No native hazel large enough to be worth propagating has been brought to notice. This is a pity because the native hazel is practically immune to a blight that attacks the large imported filbert and destroys it before profitable crops are born. On the Pacific coast, however, the disease seems not to be present, and the nut is successfully grown. Spraying with Bordeaux mixture might keep the blight under control, but what we must work for is a good filbert that is immune, by selection from native types or crosses with the foreign filbert. Such experiments are under way, and when the desired result is obtained a promising field of nut culture will be opened, for the filbert is very hardy, of rapid growth and early maturity, productive, easy of cultivation and adapted to many soils and climates.

It is the nut from which to get quick results, to tide over the period of waiting for other nut trees to mature. As fillers between such other trees the filbert ought also to be valuable.

Conquering the filbert blight is one of the most important problems of nut growing.

The Hickories. — Of this family of about sixteen members, all native only on the North American continent, the first in importance, at the present time, is the pecan. Its great development in the south has been spoken of, but it has also a future in the north.

It grows as a native in southern Indiana and the neighboring States, where immense trees are found in large groves of pure stand, and some of the nuts are almost the equal of the southern pecan in size, and equal, if not superior, in quality. The pecans of this locality have received the general name of "the Indiana pecan." The best of them are being commercially propagated and can be bought in quantity. How far north of its native habitat it can be moved, and continue to fruit profitably, is unknown. Even the southern pecan tree may be perfectly hardy in the north. There is one at Hartford, Conn., that is 9 feet 3 inches in circumference, and others in New England, but none, so far as I know, that bears an edible nut. This may be sometimes because of imperfect pollination, but is due more probably to insufficient length of growing season. Statements by nurserymen as to the bearing possibilities of any pecan north of New Jersey and Long Island are purely fanciful. One cannot say what they will do, for none are known to be fruiting.

But there is every reason to believe that pecans of the Indiana type will be found to fruit successfully much farther north than their native range, and their trial is recommended.

The Shagbark Hickory. — The shagbark is the pecan of the north, waiting its turn for the development its southern brother has had.

As it appears in the market it is as variable as the grocery store pecan; some small, thick-shelled, difficult to extract from the shell, or of inferior quality; while now and then is found one that has the opposite characteristics. At its best it is nearly the equal of the pecan in quality. Some prefer it.

There is nothing now to prevent the selection of the best of our native shagbarks, their propagation, dissemination and growing in orchard form. The ordinary run of native shagbarks retails at 15 to 20 cents a pound. If there are 60 pounds in a bushel the value of a barrel of ordinary "hickory nuts" is of easy computation. Even now selected shagbarks rival the high-priced pecans.

When we have determined the best shagbarks to grow, which we have not yet done, we can send scions to expert propagators, or we may get them to come and top work our native seedlings, or any variety of hickory, to the shagbark or the pecan of our choice. Or we may learn to do this ourselves.

The tree is perfectly acclimated over most of the northeast, and will grow in many places where only forest trees can find a foothold. It needs only to be well cared for until established, and given room for development, and it will take care of itself. It is said to do best where there is lime in the soil, which, of course, may be added.

The Walnut. — We must be on the lookout for types of the black walnut and butternut that are worth growing. Both these are native and hardy, the butternut flourishing further north than the other, and if such nuts can be found they will fill a valuable place. Their propagation is sufficiently simple, as all the walnuts can be grafted or budded interchangeably.

The Japanese heartnut has striking characteristics that make it valuable for the north. It is very hardy and grows with extreme rapidity under favorable circumstances, making a very handsome tree and bearing early a heart-shaped nut of good quality that cracks easily from the shell. This nut is worthy of extended trial, but one should have a guarantee from the nurseryman that it is not the Siebold walnut, a very similar tree, but one that bears a very inferior nut.

The Persian Walnut ("English" or Circassian Walnut, Madeira Nut). — The so-called "English" walnut is attracting more popular attention as a nut for northern growing than any other at the present moment. One reason for this is that, while it is not a native nut, here and there a tree is growing and bearing well in almost every State in the Union. Some of the best of these are being propagated and can be bought in quantity, but very probably there are better ones that have never been brought to the attention of nut growers. All such trees should be made known and studied, for it is certain that the nut is going to be one of the most valuable for northern propagation, and some day a great food and revenue producer.

Recommendations.

These depend on the tastes and wishes of the man who wants to grow the nuts. If they are strictly scientific, with time and money to back them, let him experiment with the less known kinds, such as the almond, pistache and pine nuts; let him raise great quantities of seedlings, discard the unworthy majority and test out the minority; let him help in the search for valuable types of native nuts, and labor to simplify and perfect the art of propagation; let him breed chestnuts and filberts that will resist the blights; and let him experiment with the hybridizing of nuts and all its wonderful possibilities.

If he only wants a few trees for home use, and to satisfy a variegated horticultural taste, let him set one or two trees of as many different varieties as his preferences and opportunities allow, much as he would so many fruit trees, only being sure to give them extra good care, especially for the first few years.

If he wishes to grow nuts to make money, the time is not yet come when the planting of orchards on a commercial scale can be recommended. If he were willing to risk it, however, particularly if his location or climate were especially favorable, orchards of carefully selected varieties of the Persian walnut, properly managed, would be almost certain to be profitable, and orchards of the Indiana pecan would be a bright possibility.

Far outside the native range of the chestnut, in a favorable locality, to be determined only by trial, a chestnut orchard might prove very profitable. The promising new immune hybrid chestnut may entirely change the face of the chestnut-growing industry.

The advantages and desirability of nut culture might be summed up as follows: —

Advances in the art of propagation, and other factors, have now made available nut trees that will bear early and true to type, like our apples and peaches. The uncertain seedling is no longer our sole dependence.

The products of nut culture are clean and free from disease germs, unless contaminated by unsanitary handling after cracking. The careful person will have his nuts cracked and the meats picked out at home, or cooked before eaten.

They can be kept and used as needed and do not require refrigeration like meat, and the chance of ptomaine poisoning, if possible, is very remote.

They are palatable and varied in flavor and capable of being prepared as food in many different styles.

They are of high food value, as already shown, and in cost they compete on at least equal terms with other sources of food.

After the trees are once established, but not until then, no great amount of care is necessary, so far as experience goes; harvesting can be done by a child, cold storage is not needed, the product is not soon perishable and market gluts will not be likely.

The life of many nut trees, when properly grown, is very long, much longer than that of the other fruit trees, in most instances.

Even a few nut trees about the house will supply the family, help to solve the problem of the high cost of food, and provide some income. From 21 pecan trees, seven to twenty years old, on his own home lot, Mr. J. B. Wight of Cairo, Ga., in 1911 sold the nuts for $500. The Lindsay pecan tree at twenty-three years of age bore 638 pounds of nuts.

There is no more peace and satisfaction giving occupation than that of horticulture, and no more fascinating branch of horticulture than nut growing.

HOW TO BUY FERTILIZERS.

MR. R. E. ANNIN, JR.

All plants require ten elements for their growth. These are carbon, hydrogen, oxygen, nitrogen, iron, sulphur, calcium, magnesium, phosphorus and potassium. The first four are gases, and three of them — carbon, hydrogen and oxygen — are secured by the plant from the air and water without the necessity of any aid from man. Of the six elements which come from the soil, iron, sulphur and magnesium are usually present in sufficient quantities and available forms in practically all soils. Continuous cropping, however, has brought most soils in Massachusetts to the point where nitrogen, phosphorus and potassium are not present in large enough *available* quantities to produce maximum crops. They may be called the essential fertilizing elements. Calcium (lime) is rarely needed as a fertilizing element, but is often needed as a soil amendment; that is, to sweeten sour soils and make heavy soils more friable. It may, therefore, be called an occasional fertilizing element.

In buying commercial fertilizers, therefore, farmers are buying nitrogen, phosphorus and potassium in highly concentrated form. A few things that commercial fertilizers can and cannot do should be kept clearly in mind.

1. Some of them, such as dried blood and cottonseed meal, do add some organic matter (humus) to the soil, but only a small part of what is needed.

2. They will not correct poor drainage conditions.

3. They will not overcome bad results due to poor seed, improper planting or careless methods.

4. They may have a slight good or bad effect on the physical condition of the soil, according to how they are compounded.

5. The best brands of commercial fertilizers are quickly available to plants, and so the food contained in them is mostly used the year of its application. The potash and phosphoric acid which they contain will be available to future crops if more is applied than is used the first season. From an economic standpoint fully enough should be used each season to produce the crop sought.

Barnyard manure and commercial fertilizers are often compared, to the disadvantage of the latter. This comparison would be more intelligent if it was kept in mind, that barnyard manure not only adds the three fertilizing elements to the soil, but is also the most useful of soil amendments in that it (1) adds large quantities of humus, (2) contains innumerable beneficial bacteria, and (3) opens up clay soils and makes leachy soils more compact and retentive of moisture and plant food.

A large part of the plant food contained in solid manure is very slowly available, and so the effect of a heavy application may still be seen for some years. This means a long delay in securing returns on the full investment.

In comparing fertilizer and manure it should also be noted that many farmers expect 200 or 300 pounds of a cheap ready-mixed fertilizer, costing, perhaps, $1.50 a hundred, to show as good results as 20 two-horse loads of manure, worth at least $1 a load.

The question of buying fertilizers, therefore, resolves itself into securing at the least cost the most pounds of the three elements, and in getting them in the best proportions and combinations to supply the plant as required. It is important to avoid using a large excess at any one time, and to have the fertilizer compounded so as to prevent its loss by leaching. To do this intelligently the following facts must be known: (1) the amounts and availability of the three fertilizing ingredients contained in the various goods offered for sale, (2) the value of these ingredients, and (3) the character of the soil and of the crop to be grown.

The fertilizer laws now on the statute books in most States require that all fertilizers be sold on a guaranteed analysis, and that this analysis shall be printed on the bag or container. The only figures that need be printed to comply with this law in some States are the percentage of total nitrogen, available phosphoric acid, insoluble phosphoric acid, and of total potash, but Rhode Island requires soluble phosphoric acid. The fertilizer bag sometimes has printed on it, or on the tags attached, a number of figures which might at first seem to be unnecessary, such as the equivalent of nitrogen in ammonia; but in some States this is required by law, so in order to meet all State requirements both are often given. The equivalent of potash in sulphate of potash is necessary to show the fact, in case it is not all from muriate. These figures may be misleading to some persons not thoroughly acquainted with fertilizer lore, and it would be a step in the direction of intelligent understanding of these matters if the fertilizer laws could all be made uniform as concerns these requirements.

The figures on the bag are on a percentage basis. For example, a fertilizer with 2 per cent nitrogen, 5 per cent phosphoric acid and 6 per cent potash, would contain in 1 ton, 40 pounds of nitrogen, 100 pounds of phosphoric acid and 120 pounds of potash.

While it is unnecessary for a farmer to carry in his head the exact analyses of the fertilizing materials, as these are published annually in the fertilizer bulletin of the Massachusetts Agricultural Experiment Station, it is desirable that he should have a working knowledge of the make-up of the principal raw materials, which are as follows: —

Nitrate of soda contains about 15.5 per cent nitrogen.
Sulphate of ammonia contains about 20.5 per cent nitrogen.
Acid phosphate contains about 12–16 per cent available phosphoric acid.
Basic slag contains about 12–18 per cent total phosphoric acid.
Muriate of potash contains about 50 per cent potash.
High-grade sulphate of potash contains 48–49 per cent potash.

In order to find the money value of fertilizers another essential factor must be brought into use, namely, the value per pound of the several fertilizing ingredients.

This information is published annually by the directors of the experiment stations of the eastern States, and is reproduced here in abbreviated form: —

	Cents per Pound.
Nitrogen in nitrates,	16.5
Nitrogen in ammonia salts,	16.5
Organic nitrogen,	22.5
Phosphoric acid, soluble in water,	4.5
Phosphoric acid, insoluble,	2.0
Potash in sulphate of potash,	5.0
Potash in muriate of potash,	4.0

With these two sets of figures of the analysis and trade values at hand it will be simple to compute the trade value of any fertilizer. An example will make this clear. Take the mixed fertilizer mentioned previously in this article, a 2–5–6 brand, and let it be assumed that four-fifths of the phosphoric acid is soluble in water, and one-fifth insoluble, and that all the potash is in the form of muriate of potash. It must be recognized that two fertilizers having the same trade value may still vary in their crop-producing power, dependent upon the materials used in compounding them. The value of this brand would be computed as follows: —

1 per cent nitrogen (organic) equals 20 pounds per ton, at 22.5 cents equals	$4.50
1 per cent nitrogen (nitrate) equals 20 pounds per ton, at 16.5 cents equals	3.30
4 per cent phosphoric acid equals 80 pounds per ton, at 4.5 cents equals	3.60
1 per cent phosphoric acid equals 20 pounds per ton, at 2 cents equals	.40
6 per cent potash equals 120 pounds per ton, at 4 cents equals	4.80
	$16.60

This particular material should cost $16.60 per ton at retail in the large market centers, such as New York or Boston; and to this, of course, must be added the cost of new bags and freight to the buyer's station.

Nitrate of soda analyzing 15.65 per cent nitrogen would contain 15.65 x 20 = 313 pounds of nitrogen, and should be worth $51.64 per ton.

If this simple method of figuring fertilizer values were universally used farmers would often find that they were paying too much for their fertilizing ingredients when bought in some of the mixed goods having a low analysis. These "cheap" brands are the most expensive to buy. A ton of 2–8–2 fertilizer costs just as much to mix, ship, handle and to bag as a 4–8–10, but its value will be barely half as much. It must be evident that freight is being paid in the former case on a large amount of unnecessary material on account of the lower analysis of some of the ingredients used in their manufacture. High-grade ready-mixed goods, on the contrary, are often as economical for the farmer as unmixed chemicals.

Finally, in buying fertilizers, buying the raw materials and mixing them at home will sometimes be found to be economical. A shovel, a sand screen and a tight floor are the only essentials; provided, of course, that certain of the chemicals are reground just before using them. Care must be taken, however, not to mix the materials just as they are needed, as otherwise many of them are sure to become hard and difficult to handle.

The bags in which original shipments of nitrate of soda, sulphate of ammonia, and potash salts are made are particularly likely to be torn because of the hardening of the contents. In such cases more or less material is wasted. Some of it is also absorbed and held in the bags in which it is shipped. These losses, and the necessity of cash payment for chemicals, must be considered in comparison with the good drillable condition of ready-mixed goods even after long storage, the shipment in sound new bags, the extension of reasonable credit, and the fact that the ammonia is less subject to loss by leaching than when wholly from nitrate of soda, as it frequently is in home-mixed goods.

HONEYBEES AS POLLINIZERS.—A VALUABLE ADJUNCT TO THE HORTICULTURIST.

MRS. SUSAN M. HOWARD.

Treating the subject as a fruit grower as well as a beekeeper enables the writer to appreciate the inestimable value of the honeybee as a pollinizer of certain grains, small fruits, vegetables and tree fruits. The discussion is attempted in plain terms without resorting to confusing botanical technicalities. The writer will feel amply repaid if the article is stimulative of even a minor inquiry into the ways of bee nature.

To-day the honeybee is more and more considered an invaluable ally of the farmer. The orchardist and small fruit grower consider their colonies as a part of their equipment, and their use as much a factor in the success of horticulture as is cultivation, application of fertilizers, the growing of cover crops, pruning, spraying and the like. To the farmer, especially if he be a fruit grower, a honey crop may be regarded as secondary, or as a by-product, while to the beekeeper it is the primary product. Thus while the ultimate aims of the horticulturist and beekeeper may be different, yet they are interdependent.

While the orchardist may profit by the visits of bees from near-by apiaries, or from a wild colony in a tree, roof or chimney, yet the uncertainty of their service is so great that the forehanded fruit grower provides a sufficient number of colonies at hand and among his trees. In this connection it may be said that it is not absolutely necessary to place the colonies actually in the orchard, yet they should be not far distant. Furthermore, the location of the bees should not prevent satisfactory cultivation.

As a factor of the importance of bees near by an orchard, it may be cited that the distance at which bees gather pollen is limited, seldom exceeding one-half mile, which emphasizes the desirability of bees at close range. On the other hand, bees will forage for honey at a greater distance, up to about 3 miles from the hive. Nevertheless, they prefer frequent and short trips. Thus if a radius of 3 miles be allowed, — that is, a diameter of 6 miles, — the area of the circle would be 28 square miles, or 18,080 acres, a part of which territory would be imperfectly worked. It should be remembered that bees foraging for honey frequently serve as the bearers of pollen in cross-pollinization, as well as bees foraging for pollen alone. It is this search of the bees for their food which prompts their inestimable service to the fruit grower. The means and mechanism of their operation, though mechanical yet intricate, is referred to below. Being mechanical, it might be accomplished by man at great expense and with exceeding labor, but this is generally recognized as impracticable from the commercial standpoint. Bee labor is far cheaper than human labor.

This expensive process of hand pollination is exceptional and only one case is reported. In this instance the process was resorted to by a cucumber grower to whom the sting of the honeybee was seriously poisonous. The process, however, is exceedingly old, and according to Herodotus is known to have been practiced five centuries before the Christian era. Much the same method is to-day reported as that used by this cucumber grower who has resorted to hand pollination, and who employs the tip end of a stiff feather by which he transfers the pollen of one flower to the sensitive pistil of another. In contrast to this laborious method, the far more common practice of the growers of cucumbers under glass is to utilize a colony or more of honeybees in their greenhouses. Thousands of colonies of bees are thus used in the hothouses around Boston and in Massachusetts. Unfortunately, too, many or most of these are sacrificed, as the growers make little or no effort to save the colonies which have served them so faithfully in the tropical climate of the greenhouse, — conditions adverse to their well-being.

The Relation of the Honeybee in the Transfer of Pollen.

It is far from the purpose of this paper to enter the vast and intricate field of hybridization, involving the problems of plant selection, improvement and the production of new varieties. Neither can the details of the life history of the honeybee be given in detail, which is as unlimited and wonderful a field as are the intricacies of the plant world, yet it is desirable to make clear the relation and service of the honeybee to the setting of our common fruits and vegetables.

It should be remembered that in most plants the setting of the fruit involves a sexual process. In plants, in contrast to animals, the same individual may bear both sexes or the sexes may be apart in different individual flowers. More in detail these may be grouped under three headings: —

1. *Both Sexes in One Flower.* — Some plants produce perfect or bisexual flowers, that is, those in which both the male and the female organs of the flower, the stamen (male) and the pistil (female), are complete within the flower. As an example, Parson's Beauty strawberry may be cited.

2. *The Sexes separated in Individual Flowers.* — Other plants bear flowers which are individually staminate (male) and pistillate (female). Yet both sexes appear on the same plant, as, for instance, in the squash, melon and cucumber.

3. *The Sexes separated in Individual Flowers which are borne on Different Plants.* — As a further modification of the second class, there are also plants which produce only staminate (male) blossoms throughout the entire plant, and are spoken of as male trees or plants. Others produce pistillate (female) blossoms throughout the entire plant, and are spoken of as female plants. Examples of these are found in the willows and poplar. The Sample strawberry is pistillate (female).

It at once becomes apparent in recognizing that most of our fruits and vegetables involve a sexual process or the union of the pollen and germ of the egg, that there must be some means of union, especially in the second and third classes of flowers, where the two sexes are respectively separated either in individual flowers or in individual flowers on separate plants. From practical experience, moreover, it is generally conceded that the honeybee is the most important of the many agents in this service. Other insects render their service as well, but their service cannot be depended upon. Their numbers are uncertain and fluctuating. They may be absent at the very time when they are most needed, as, for instance, at the height of apple bloom. Thus it is claimed that the honeybee is first and foremost the most important, and that it should be provided and conserved by the farmer.

Since there are differences in pollen, however, it might be contended by some that the wind is active in transferring the pollen from tree to tree or blossom to blossom. To be sure, some pollen is lighter than others and easier carried by the wind, but in the provisions of nature, pollen which is light and transferable on the breezes is designed so to be carried, and trees which bear it are usually wind pollinated, those which are actually independent of insects. The pines furnish an example. Observations are not infrequent where the air has been seen filled with millions of pollen granules drifting with the wind. But among the fruits and vegetables the pollen is usually more heavy and inclined to be sticky or viscous, as is the case with the pear. This heavy pollen, in order to be transported, is dependent upon the service of some insect, usually the honeybee, and is capable of being carried by the wind to a very slight, if any, extent. In the case of apples, too, experiments have been conducted which tend to prove that little or no pollen in the apple orchard drifts on the wind.

This service of the honeybee, alluded to in transferring pollen, may be regarded as performed unconsciously or unintentionally while seeking for nectar or pollen in the flowers. In procuring the nectar, for instance, which flowers dependent upon the services of insects usually produce in abundance, there is a secretion in the nectary or honey-cup at the base of the flower. The bee, for illustration, dusts off particles of pollen which become entangled in her hair. Then the bee in quest of more nectar flies to another blossom and in the course of her search for nectar therein leaves some of the pollen grains on the female organ of the blossom (pistil). Thus, almost mechanically and accidentally, the function of the bee has been performed in this vital operation. Finally, the pollen lodged on the sensitive pistil germinates much as does seed, and sends forth or projects a slender growth or thread which gradually finds its way down through the pistil and reaches the true female element or ovule which is virtually the embryonic seed. Here, there is a fusion of the male and female elements which, when it occurs, perfects the process known as fertilization, wherefrom results a perfect seed.

Many plants are sterile to their own pollen and require pollen from another source. Furthermore, self-fertilization is thought to tend to weaken the offspring, and in contrast crossing or cross fertilization is thought to result in greater strength and productivity. Moreover, flowers are generally constructed to favor cross fertilization and to prevent perpetual self-pollination.

From the standpoint of the plant, the results of crossing become apparent especially in the second generation. Thus the Baldwin apple blossom may be fertilized by pollen from a Porter apple. The resulting apple will develop as a Baldwin, yet one or more of its seed when planted may produce a variety, differing in many respects from its parent. Thus the bees may serve to make new crosses and to increase varieties.

There is also another feature, namely, the apple requires five independent fertilizations for complete results. The lack of even one of these may impair its vigor and change its appearance, resulting in an imperfect development or malformed fruit. Incomplete fertilization also explains the dropping of apples, and suggests that the more complete service of bees might avoid this consequent loss.

Some light may be thrown on the dependence of flowers on bees by a few concrete examples. An experiment was conducted in which 100 clover blossoms were covered with netting in order to exclude bees, with the result that not a single seed was produced. Similarly 100 blossoms exposed to the visits of bees produced, in contrast, 2,720 seeds, showing conclusively the need of bees in seed setting in clover.

With the apple, 2,586 blossoms were covered and the entrance of bees prevented, with the result that only three apples matured.

It is not uncommon to observe from 4 to 6 bees eagerly at work gathering honey and pollen in a single squash blossom. The writer has noted 8 bees simultaneously in a squash blossom; within an hour 28 bees were counted flying from the same blossom.

The number of flowers a bee will visit may vary according to the amount of nectar being produced. A bee can visit ten to fifteen flowers a minute, yet she will remain longer on a flower if the nectar is flowing freely. In that case, she would secure her load without visiting as many flowers.

In attracting bees to a flower, there are several stimulative factors, namely, the nectar and pollen, color and odor. The multiplicity of trees in full bloom increases the attraction. Nevertheless, high color or extreme fragrance do not always induce the bees to visit, for the lilac and heliotrope are neglected, while some of the less conspicuous flowers prove enticing.

Besides the nectar in the flower, bees are in search of pollen as a food. This is a highly nutritious substance, supplying nitrogen and phosphorus, — two needed elements in animal economy. To be sure, this pollen is provided vastly to the excess of the actual needs of bees, but its seeming overproduction may be explained on the ground of an effort on the part of the plant to insure pollination.

It has been claimed that the honeybee sucks juices from fruits. Although bees are observed commonly on fruits, yet it is certain that the bee does not puncture a sound fruit as has been supposed. When fruits are worked by bees, an opening has previously been made by some bird or wasp or by decay. Thus the bees take up the work begun by another or afforded them through some other agency. Many orchardists have mentioned this to the writer who at the same time give due credit to the bee for the good she accomplished. It has also been the writer's privilege to dispel this idea through experimentation and by references to high authorities who refute the charge against the bee. It should be borne in mind that the jaws of the bee are smooth and rounding and quite unfit to make an opening in a sound fruit. On the other hand, the jaws of the wasp are perfectly equipped for puncturing and opening fruit. In order to substantiate that bees are unable to puncture sound fruit, the writer has suspended a sound but over-ripe peach and pear in front of the entrance to a colony. These nevertheless remained untouched, even during a scarcity of nectar in the fields.

THE INTERRELATION OF SPRAYING AND BEEKEEPING.

While the value of the honeybee as an agent in the distribution of pollen has been emphasized, it would be remiss to fail to mention correct spraying practices. To spray any plant while in flower, more especially fruit trees while in bloom, offers baneful results. It is the old story of killing the goose which lays the golden egg. Many colonies are either damaged or lost at the time of spraying, through poison deposited in the nectar cups of the flowers. If the loss is not apparent at the time, a colony may be so crippled as to preclude its successful wintering. It is now conceded by high authorities that spraying in fruit bloom is injurious not alone to the bee but to the flower. Any solution strong enough to kill the codling moth larvæ may be harmful to the delicate reproductive organs of the flower. In erroneously spraying during fruit bloom the supposed aim has been to kill the codling moth. The eggs are usually laid on the foliage of the young shoots. The larvæ hatch and travel ultimately to the young fruit. There they either burrow through the side of the fruit or usually through the calyx end into the core. Since these larvæ of the codling moth are not hatched and present in the blossoms, it is a faulty method to try to kill them by sprays during the blooming period, especially since the spray may injure the setting of the fruit. Moreover, this poison may effectually be distributed over the foliage and into the calyx cups at any time within ten days after two-thirds of the petals have dropped. It should be borne in mind that it is the eating of the poison and not the contact with it which kills the codling moth.

Some States have enacted laws prohibiting spraying during fruit bloom, and have imposed penalties for their violation. To the intelligent fruit grower no such prohibition should be needed, as reason and judgment would dictate otherwise. Beekeepers and fruit growers all should strive in every way possible to spread this information concerning the time and kind of spray, and the reasons and seasons for spraying.

While it may be quite impossible to regulate and restrain individuals, yet it may be suggested that contract sprayers should be licensed in order to control or make certain that their methods conform to existing laws and customs. To the beekeepers it is a pitiable sight tQ see struggling, half-paralyzed worker-bees staggering about the hive entrance and crawling up the grass blades unable to enter the hive. This is a violent shock to the colony.

Horticulturists, fruit growers and beekeepers must unite for mutual benefits to prevent the uncalled-for sacrifice of the honeybee. Similarly, every means that ingenuity can devise to improve the breed and management of bees should be adopted. Every possible provision should be made for housing, feeding and manipulating, especially before and after the fruit and garden bloom.

More bees and better bees, more trees and better trees! This will insure increased production of both fruits and honey.

The planting of linden or basswood trees, beloved by bees, is especially to be recommended for shade along the street and the highway, or as an ornamental tree in parks and on estates for forest plantations. It is of quick growth, symmetrical, with smooth bark. The wood is highly valued for lumber. It produces honey of exceptional quality and in abundance, which comes at a time of scarcity of nectar in most sections. The recommendation of the planting of this tree is inspired by a desire to increase its prevalence, thereby promoting beekeeping. Any advantage which it offers to the bee rebounds to the mutual good of the horticulturist, fruit grower and beekeeper. To one who has heard the incessant hum and medley of song of the honeybee flitting among the blossoms of the linden tree on a July day no description by pen or spoken word is adequate.

As a final word, the testimony of farmers in the vicinity of the writer's apiary is convincing even to the most skeptical as to the value of bees. This testimony has always been favorable and given without solicitation. There was but one answer to a physician who inquired the reason for the abundance of fruits in the orchards and occasional fruit trees in the vicinity of the writer's apiary, while in more remote sections of the town there was a noticeable scarcity of fruit. The favored district profited by the faithful work of the writer's honeybees.

TWELFTH ANNUAL REPORT

OF THE

STATE NURSERY INSPECTOR.

PRESENTED TO THE BOARD AND ACCEPTED,
JANUARY 14, 1914.

TWELFTH ANNUAL REPORT OF THE STATE NURSERY INSPECTOR.

To the State Board of Agriculture.

I have the honor to submit herewith the twelfth annual report of the State Nursery Inspector.

Inspection work during the year 1913 has proceeded along the usual lines. Inspection of growing nursery stock has shown that the various insect pests and diseases liable to occur have been kept well under control by the nurserymen, and the inspector has served mainly to locate these troubles in places where they were not known to exist in the nurseries. All such places were immediately treated under the direction of the inspectors, and the trouble, whatever it might be, was removed, or in cases where this was impossible the stock affected was destroyed or withdrawn from sale for treatment later. In general, the nurseries were in as good or better condition than in previous years, and the general standard has shown a decided improvement.

No case of the chestnut bark disease has been discovered on nursery stock. In fact, there are very few chestnut trees in our nurseries, and call for them is so small that it is not probable any large increase in their number will soon occur.

The white pine blister rust situation is more serious. This is a very dangerous disease, attacking all of the five-leaved pines, and so far as the inspector can learn no tree which it has once attacked recovers. It first appears as a local thickening of the bark, and may remain in this condition for several years. Sooner or later, however, it breaks through the bark and develops spores or seeds which are scattered by the wind. If any of these fall on currant or gooseberry bushes they develop in the plant, forming orange specks on the under side of the leaves. From these, newly formed spores spread to other currant or gooseberry plants and start other cases of the disease there. Later in the season the growth on these leaves changes in its form, and the spores now produced will grow in any five-leaved pines to which they may be carried by the wind.

This disease is a very dangerous one, and if it should become established in this State any attempts at reforestation with white pines might as well be given up. Recognizing this, and knowing that the disease was actually being brought into Massachusetts on white pines imported from Europe, an order was issued prohibiting the importation of trees liable to the disease after June 1, 1912. A similar prohibiting order applying to the entire United States was issued by the Federal Horticultural Board Sept. 16, 1912, and as a result of these actions there is no longer any danger of new cases of the disease reaching the United States while these orders are in effect.

The danger from diseased pines imported before June, 1912, remains, however, and during the past year it has been attempted to examine all the pines imported into Massachusetts since 1905. It has been very difficult to learn of all such imports, but many have been found, and in some cases the disease has been found on the trees.

In this work it should be remembered that the disease though present does not show on the tree, sometimes, for several years, working entirely inside. This must mean examination of all suspected plants at least once a year for a number of years. The best time for this is during May and June, as then the spores, if any are to develop on the outside that season, will be in evidence. Later in the year an inspection of the currants should show the disease if diseased pines are in the vicinity. During the past year these inspections have been carried out as far as time and funds would permit, and the result has been to locate the blister rust in quite a number of places where it was not hitherto known to be present. To extend our knowledge of the distribution of this dangerous disease, and to eradicate it as rapidly as possible, either by the destruction of the infested pines or currants, as the case may be, are the next steps, and it is planned to continue work on these lines the coming season.

Massachusetts ranks fourth among the United States as regards the amount of nursery stock imported, and the examination of this stock forms a large part of the work of the inspectors. During the year 1913 more than 716 shipments including about 4,270 cases of stock, have been inspected, and numerous insects and diseases not now present in the United States have been discovered and destroyed. To any one who stops to think that the gypsy moth, brown-tail moth, San José scale and many of our most serious pests are not natives of this country, and that there are still many other dangerous insects which have not yet reached this country, the importance of the examination of imported nursery stock at once becomes manifest.

To a less degree, perhaps, it is important to examine nursery stock sent to Massachusetts from other States. It is not often that cases occur where new pests are found on such stock, but it is certain that without such a supervision stock of inferior quality and unduly infested would be sent in, thus reducing its value to the purchaser, and in many cases, at least, without his even being aware that the stock was not what it should be.

The quarantine of nearly all of Massachusetts because of the presence of the gypsy and brown-tail moths, by the Federal Horticultural Board last year, was considered in my last annual report. Since that time the quarantine has caused considerable inconvenience, but has not prevented doing business with other States. With the small number of inspectors available on State service, the examination of each shipment of stock for the gypsy and brown-tail moths. as it was sent out, was manifestly impossible, and to meet the difficulty, men trained in this kind of work were loaned by Mr. D. M. Rogers, superintendent in charge of the government work in this line, for the purpose. These men were practically acting as State officials enforcing United States requirements, and this somewhat peculiar arrangement was only undertaken at the wishes of the nurserymen, who expressed the desire that all inspection should be centered under one head rather than under two. The situation was far from satisfactory, however, and finally, on the 1st of November, 1913, the State inspection service withdrew from any connection with the quarantine work required by the United States, believing that the difficult period of transition from the old to the new conditions was at an end. Thus far matters have seemed to work as well under this new division of duties as before, and it is certain that the real responsibility for any blunders or oversight can now be placed wherever it may belong.

As before, the State has been divided into two districts, the western one being under the personal supervision of the inspector himself, while all details in the eastern district have been in charge of Mr. W. S. Regan, 136 State House, Boston. Entire supervision of all general policies and management has, however, been retained by the inspector, and all important details have also been determined by him. Mr. Regan's work has been most efficient and satisfactory, but as he has found it necessary to withdraw from the work for a time, a leave of absence has been granted him, and Mr. R. H. Allen has been appointed to temporarily take charge of the eastern district.

The active interest of the secretary of the Board in the inspection service should be mentioned here, as without his kindly assistance the work would have been far more difficult to carry out, and much of its efficiency has been due to his co-operation.

Financial Statement.

Appropriation,		$15,000 00
Compensation of inspectors,	$6,776 53	
Traveling and necessary expenses,	6,187 75	
Expenses of inspectors whose salary is paid by the United States,	1,067 76	
Supplies (postage, printing, etc.),	212 26	
Clerical services,	330 34	
Salary of chief inspector,	500 00	
		15,074 64
Overdraft,		$74 64

Respectfully submitted,

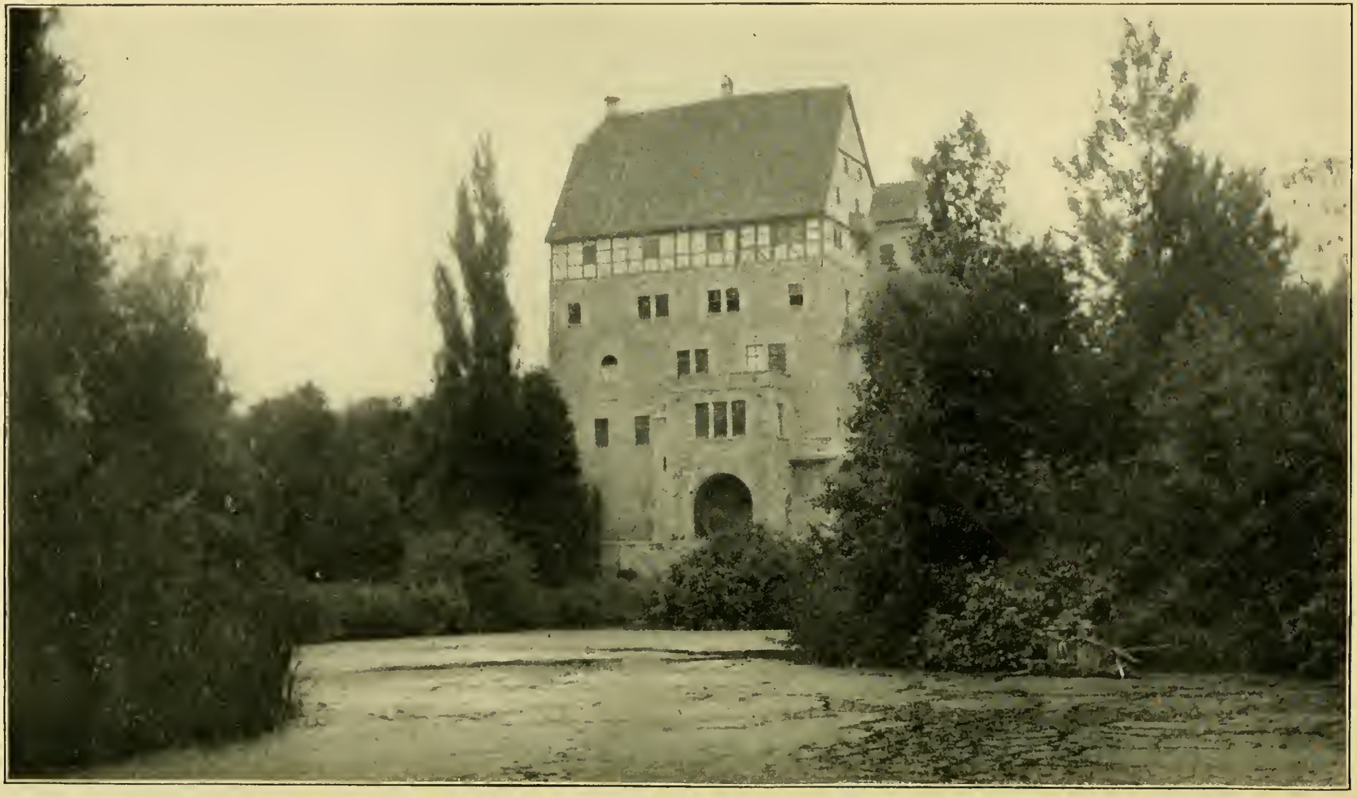
H. T. FERNALD,
State Nursery Inspector.

SIXTH ANNUAL REPORT

OF THE

STATE ORNITHOLOGIST.

SYNOPSIS PRESENTED TO THE BOARD AND ACCEPTED,
JANUARY 15, 1914.



View of the castle pond of the eminent ornithologist and bird protectionist, Baron von Berlepsch, Seebach, Thuringia. Moorhen's nest in nesting box on the platform on the shore at the right. (Photo by William P. Wharton.)

SIXTH ANNUAL REPORT OF THE STATE ORNITHOLOGIST.

Educational and Legislative Work.

During the year 1913 somewhat less than the usual number of free illustrated lectures on the utility of birds and the means of increasing their numbers were given, owing to a pressure of other educational work; but the audiences at these lectures have averaged much larger than at those given in 1912. The demand for lectures by the State Ornithologist increases year by year. These talks have been the means of interesting very many people in the protection of birds, have induced citizens to put up thousands of nesting boxes for birds within the past ten years, and have encouraged greater numbers of people to feed and protect birds.

A revision and enlargement of the State publication, "Useful Birds and their Protection," which was undertaken late in 1912, was completed and printed in 1913 in a fourth edition revised. The scientific names as published in the first edition in 1907 have been brought down nearly to the date of publication. An appendix regarding European methods of attracting birds, and the planting of fruiting trees, shrubs and vines for birds has been added, and the index has been much amplified.

Many newspaper articles have been written during the year which have been published not only in the Massachusetts press, but in other papers of New England and New York. Such articles asking people to feed the birds in winter, and giving directions therefor, and others explaining how useful birds may be protected about the home, have thus been given very wide circulation. Great numbers of letters inquiring about these methods have been answered fully, and many visits of instruction have been made to the homes of people engaged in carrying out plans for protecting birds.

A series of experiments in destroying rats was carried on during the summer, with the intention of publishing a bulletin on the subject in the autumn. At that time, however, rats were found to have invaded several game preserves in the State, becoming the most serious menace to the rearing of birds on game farms. As this is a new industry, which is likely to become an important one in the near future, it was determined to study the conditions on some of the preserves and watch experiments there. This delayed the publication of the bulletin until another year, but it probably will be printed before this report reaches the public.

Federal Protection of Migratory Birds.

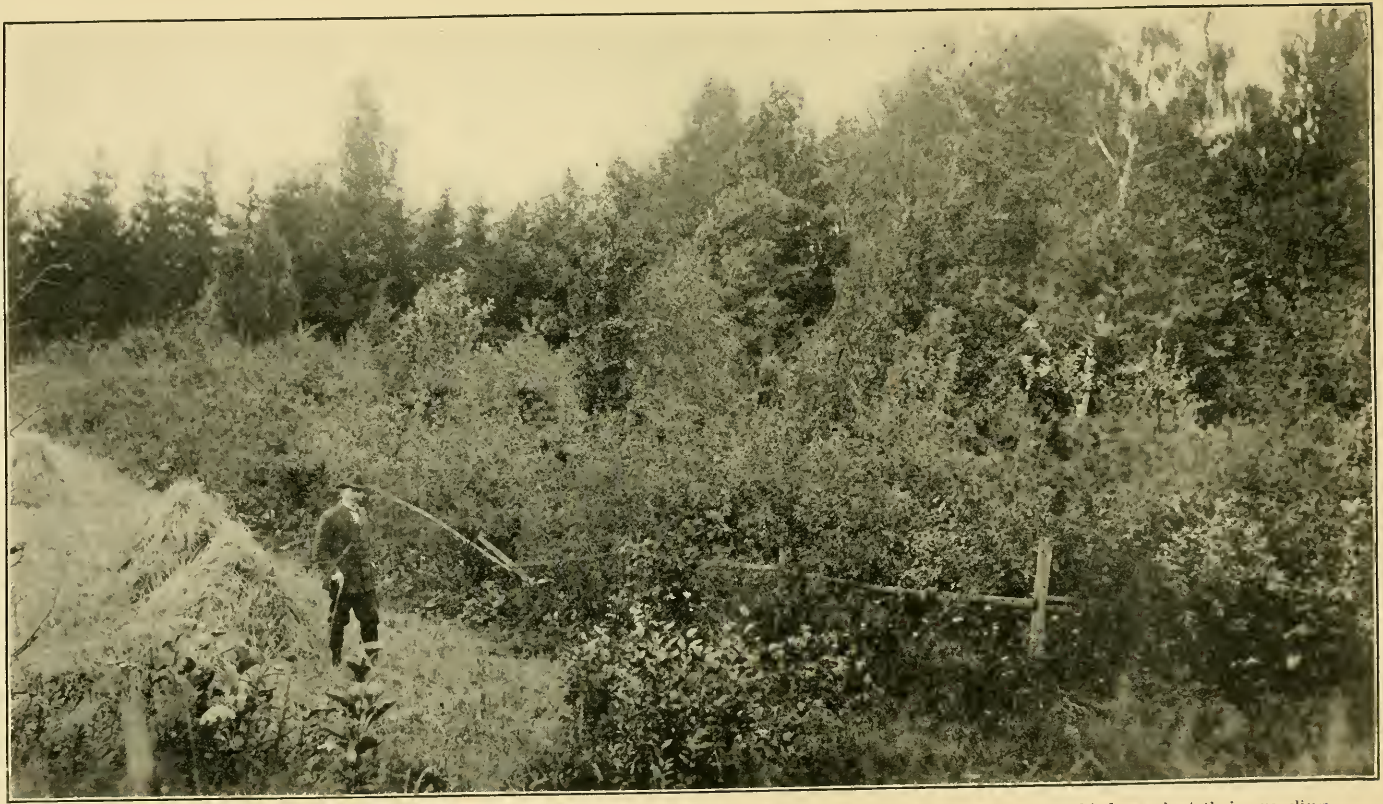
The attempts that have been made to secure uniform legislation for the protection of migratory birds in the various States of the Union have shown the futility of such efforts, and have proved that federal protection alone is feasible.

The educational and legislative campaign entered into by the State Ornithologist in 1907, in the hope of securing federal protection of migratory birds, was brought to a climax in 1913 by the co-operative efforts of the National Association of Audubon Societies and other associations, and was at last successful.

Hon. George Shiras, 3d, first introduced in Congress a bill for the protection of migratory game birds in 1904. Since then several similar bills have been introduced, but all have been "smothered" in the committees to which they have been referred for consideration. In 1912 both Senator George P. McLean of Connecticut and Congressman John W. Weeks of Massachusetts introduced bills, similar in character, drawn to include the protection of migratory insectivorous birds as well as game birds, and for the first time these bills received serious consideration by Congress. In 1911 Rev. J. B. McLean, brother of Senator McLean, opened a correspondence with me inquiring for information about the usefulness of insectivorous birds. The information was furnished, and on April 26, 1912, Senator McLean presented to the Senate a report from the committee on forest reservations and the protection of game, embodying much of this material. The matter, however, was not carried further by Congress that year, but when the next Congress convened, early in January, 1913, an attempt to create public sentiment in favor of this bill was made by the National Association of Audubon Societies of New York, the New York Zoölogical Society and the American Game Protective and Propagation Association. This latter association, then recently organized, began waging a vigorous and well-directed campaign indirectly through its membership, and directly in Congress by its president, Mr. John J. Burnham, and its vice-president, Mr. William H. Haskell. Their efforts, together with those of the game commissioners of the country and a great number of protective associations, Audubon societies, granges and interested individuals, notably Mr. Henry Ford of Detroit, Mich., turned the tide in favor of the bill. A hearing was given before the Senate committee to those desirous of being heard on January 14, and on January 23 the bill was passed by the Senate. As the session was short the officers of the American Game Protective and Propagation Association immediately planned a vigorous campaign in the House. Influence was brought to bear from nearly every part of the United States, but many other important matters were pressing for action, and it seemed impossible to bring the bill to a vote. As it carried an appropriation of $10,000 it was finally added to the agricultural appropriation bill and passed with the bill in the last days of the session.

This is the most far-reaching and effective law that has ever been passed for the protection of migratory birds. It gives the United States Department of Agriculture the power to regulate the open and closed seasons for migratory game and insectivorous birds throughout the United States, the regulations to go into effect when signed by the President. A series of regulations, and a comprehensive plan for their enforcement, were worked out by a committee from the Biological Survey, United States Department of Agriculture, composed of Dr. T. S. Palmer, Prof. Wells W. Cook and Dr. A. K. Fisher. An advisory committee was appointed, also, to confer with these gentlemen, including ornithologists and game protectors in many parts of the United States, of which the State Ornithologist of Massachusetts was a member. Hearings on the question of adopting the proposed regulations were held at convenient points by Dr. Palmer with members of the advisory committee, and finally on Oct. 1, 1913, the regulations, with some minor changes, were approved and signed by the President and now have the effect of law. They do not affect local, non-migratory birds of any State. In view of the fact that many of the shore birds and some of the waterfowl have diminished to a point where they are approaching extinction, special protection was extended to certain species throughout the year, and to others at least three-quarters of the year. Spring shooting was forbidden everywhere. Arrangements were made to protect migratory game birds at all times everywhere between sunset and sunrise; to protect waterfowl at all times along at least three of the great navigable rivers of the country; to make the shooting season approximately equal in length in different parts of the country, and to limit it to a maximum of three to three and one-half months. Most migratory insectivorous birds are protected uniformly at all times in all States. Protection for five years is provided in some States for birds like the wood duck, which already have such a close season under the laws of those States, and a similar close season has been declared on all the smaller shore birds throughout the United States. More than fifty different open seasons for migratory birds had been provided formerly under State statutes which were still in force in 1912. This had anything but a beneficial effect on the abundance of game. Now under the federal law the country has been divided into two zones as nearly equal in size as possible, one to include the States in which many migratory game birds breed or would breed if given spring protection, and the other the States in which comparatively few breed, but in which many winter. In no case does the zone boundary cross a State line. In Massachusetts the federal laws make little change except to prohibit night shooting, but in many other States, particularly in the south, where many of our birds winter, much additional protection is afforded to the birds and game.

Thus the work in the New England States to secure uni-



"Shelterwood" plantation on edge of a wood at Seebach, surrounded by a hedge of thorny bushes to protect nesting birds against their prowling enemies. (Photo by William P. Wharton.)

form laws for our migratory birds has been extended throughout the country by co-operation with the many forces now at work for bird protection.

Following the passage of the act, the Senate of the United States passed a resolution, authorizing treaties with other nations on the subject of bird protection, and international negotiations with this end in view are now under way, and may eventually result in similar protection to migratory birds in all American countries. All that has been accomplished, however, is a mere beginning. In many parts of the United States public sentiment must be educated to support the government in protecting the birds. State laws must be made uniform with federal regulations. Larger appropriations for enforcement of the federal regulations must be secured. A tremendous amount of work remains to be done before effective protection of migratory birds can be considered a fully accomplished fact throughout the land.

A Blow at the Plumage Trade.

While the friends of the birds were still engaged in educational work to secure the passage of the McLean-Weeks bill for the protection of migratory birds, Mr. Henry Oldys of Washington, a well-known lecturer on birds, and president of the Audubon Society of the District of Columbia, began maturing a plan to stop the sale of the plumage of wild birds in the United States.

On Dec. 28, 1912, the idea first came to him, and he immediately wrote me a letter explaining the plan and asking my co-operation, following this with letters to Mr. William Brewster, president of the Massachusetts Audubon Society, Mr. T. Gilbert Pearson, secretary of the National Association of Audubon Societies, Dr. William T. Hornaday, director of the New York Zoölogical Park, and other prominent ornithologists and bird protectors. On January 3 he wrote that his plan had the approval of Mr. Henry Henshaw and Dr. T. S. Palmer, chief and assistant chief of the Biological Survey, and that it looked feasible. It was proposed to destroy the American trade in the plumage of wild birds by securing the insertion of a clause in the new tariff bill prohibiting the importation of such plumage. Mr. Oldys pointed out that the slaughter of birds for millinery purposes was then greater than at any time in the history of the world; that the United States was one of the chief markets for such plumage if not the largest; that the State laws aimed against the traffic were proving ineffective; and that many species of birds in American and other countries were being rapidly exterminated by the trade. Australia already had adopted a similar plan to check the slaughter, in the belief that no other remedy would be so effectual. A little later, while in Washington to press the passage of the McLean-Weeks bill, I accompanied Mr. T. Gilbert Pearson in interviewing congressmen with a view of obtaining a hearing for this cause before the ways and means committee. This request was not granted at once, but later, when many members of the Audubon societies from many States joined in the request to the ways and means committee, an appointment was made for a hearing, and on Jan. 30, 1913, three different amendments to schedule N of the tariff bill were presented before the committee by Dr. William T. Hornaday for the New York Zoölogical Society, Mr. T. Gilbert Pearson for the National Association of Audubon Societies and Dr. G. W. Field for the Commissioners on Fisheries and Game of Massachusetts.

The proviso of the New York Zoölogical Society was finally reported by the committee. It reads as follows: —

> *Provided,* that the importation of aigrettes, egret plumes, or "osprey" plumes, and the feathers, quills, heads, wings, tails, skins or parts of skins, of wild birds, either raw or manufactured, and not for scientific or educational purposes, is hereby prohibited, but this provision shall not apply to the feathers or plumes of ostriches, or to the feathers of domestic fowls of any kind.

This was incorporated in the tariff bill when the bill was reported on April 6, and passed with the bill by the House of Representatives on May 8. In the meantime the feather importers had been stirring up the millinery trade to oppose the measure, and seeing that they could not defeat it in the national House of Representatives they turned their attention to the Senate.

They employed eminent counsel to go to Washington, circularized the millinery trade widely, and made such an able and effective campaign against the plumage proviso in the Senate that when the subcommittee of the Senate ways and means committee heard the case on May 21 it was plain that the members had become prejudiced against the proviso and were in favor of an amendment presented by the friends of the importers, which would practically nullify the measure and allow the importation of all wild birds' feathers except, perhaps, those of egrets, the prohibition of which many of the importers were willing to concede if they could continue to import all others.

Now was begun in earnest an educational campaign in behalf of the birds. Personal letters, circulars, newspaper and magazine articles were sent out by hundreds and thousands showing the necessity of this legislation. Dr. William T. Hornaday, director of the New York Zoölogical Society, struck sledge-hammer blows through the press of the country. Mr. Pearson exerted a tremendous influence through the Audubon societies of the country. Meantime Mr. Oldys, the father of the movement, lectured in many States and wrote articles for the press. It was shown that if the amendment prevailed, American birds' skins would be shipped as before to London and Paris, their feathers dyed and "manufactured," and shipped back here to be sold; that American migratory birds of the United States would be killed in Canada, Mexico, the Antilles and Central and South America, and their feathers sold in our markets. Every argument possible was brought to bear on members of the finance committee, but on June 17 the importers won their fight in that committee which then reported a nullifying amendment, and on July 11 the amendment was sent to the Senate with the approval of the democratic caucus.

Again at this juncture the Hon. George P. McLean of Connecticut, who was now looked upon as the Senate leader in the war for bird protection because of his magnificent fight for the McLean-Weeks bill, came to the rescue and helped to organize a defence of the original proviso. It was arranged to have Mr. T. Gilbert Pearson of the Audubon

Society, Mr. William H. Haskell of the American Game Protective and Propagation Society, and Mr. Marshall McLean of the Camp Fire Club go to Washington. I went to New York and arranged with Dr. Hornaday to send Dr. William R. Lord of Massachusetts to Washington, where his valuable services did much to save the proviso from final defeat. On July 21 Senator McLean offered an amendment providing for the adoption of the proviso as it came from the House.

On August 16 he made an able and convincing speech on his amendment, and the measure was recommitted to the finance committee on the motion of Senator Simmons, its chairman. On September 1, however, this committee practically reaffirmed its former position, and on September 2 its recommendation was indorsed by the democratic caucus after a long debate, although a majority of the Senate was believed to be against it and for the original proviso. This was the last victory of the importers, however, for Senators Lane and Chamberlain of Oregon refused to abide by the decision of the caucus and, other senators being strongly with them, this stand of Messrs. Lane and Chamberlain saved the day. The caucus reconsidered its vote and adopted the House proviso, which was passed with the tariff bill by the Senate on September 9. No change was made by the conference committee, but in another part of the bill the importation of artificial feather flies for angling was permitted. The bill was passed by the House on September 30 and signed by the President October 3. Thus the contest for federal protection of birds in 1913 was at last successful. It had greater and more favorable results than any former bird legislation in the history of the world. It set an example which will bring about the adoption of similar measures in other countries. It is impossible to compute the number of persons who individually or through organizations aided in this campaign. The number of volunteer workers must have been enormous.

Massachusetts contributed her share. Among other organizations the Massachusetts State Grange, Patrons of Husbandry did excellent work through its master, Charles M.

A recent plantation for a shelterwood for birds in the open farming country, at Seebach. (Photo by William P. Wharton.)

Gardner, and its committee for the protection of birds, which, through its zealous secretary, Mrs. E. O. Marshall, exerted great influence not only in Massachusetts but in other States.

Progress in attracting and protecting Birds.

The interest in birds continues to grow and spread. In most Massachusetts towns there are people now who take pains to attract and protect them. Many people during the past year have put up nesting boxes made on the von Berlepsch plan in imitation of woodpecker homes. These have not been so uniformly successful as was expected, possibly because those who placed them did not always choose the right situations; because the size of the entrance holes was not always right for the birds that came to occupy them; or because our American birds do not take so kindly to this pattern of nesting box as European birds do. As far as can be learned no one in Massachusetts has had so much success as attended the experiments of Mr. William H. Browning on Long Island, where, as noted in a former report, about 200 boxes were put up and most of them occupied. Undoubtedly, however, a large proportion of the birds which nested in his boxes were starlings, with some sparrows, both European birds. No box with an entrance hole smaller than 1¼ inches in diameter is very likely to be used by any American bird except the wren. Chickadees have been known to enter a box with an entrance 1⅛ inches in diameter, but they seem to prefer the larger opening.

Woodpeckers are said to use these nesting boxes in Germany. The only woodpeckers that I have known to take them in this country are the flicker and the red-headed woodpecker; but these have nested also in rectangular boxes when ground cork or sawdust has been supplied to keep the eggs from rolling about. The forestry department of Brookline, Mass., learning that the woodpeckers were destroying the imported leopard moth, purchased and placed in the trees a number of nesting boxes in the hope of attracting these birds. The "Boston Globe" of April 19, 1913, says that two boxes have been occupied by them but no details can be learned.

Mr. Robert W. Day of Springfield is setting out a great number of young pines in Hampden, Mass. He has had much trouble with the pine weevil (*Pissodes strobi*), which destroys the pine top and causes a crook in the trunk injuring or ruining the timber. He is now putting up nesting boxes for the birds, and is putting out suet and other food for them in winter to attract them to his pines, in the hope that they will destroy the weevils.

Mr. L. B. Sherman of Marshfield, Mass., has a cranberry bog which he has surrounded with bird houses, and numbers of birds are breeding in them. The bird houses have two tenements, and he claims that sometimes both are occupied. Mr. O. C. Bourne, Deputy Fish and Game Commissioner, says that he visited Mr. Sherman's place and believes that many of the birds in the surrounding country gather about that bog. It will be interesting to note what effect the birds will have on the destructive insect enemies of the cranberry plant.

People who have succeeded in destroying or driving out the English sparrow have had greater success in attracting and protecting birds than others. Mr. Sewall A. Faunce of Boston deprecates the decrease of English sparrows, and writes, "Just why you have condemned our best pest destroyer is a mystery to me, and I am certain it is leading to their extermination. Few are left with us now, and we are driven to substitute insecticides, which damage the plant even if they kill the worms. Sparrows are harmless and eat the worm. One of my neighbors has just waked up to the situation and corroborates the statement that sparrows pursue and destroy the brown-tail moths besides caring for our woodbines, rose bushes, fruits and trees." It is now quite generally admitted that this sparrow destroys a great variety of insect pests. Its objectionable habits are too well known to recapitulate them here. No doubt some local decrease in English sparrows may be accounted for by a disease supposed to be a species of coccidiosis, which attacks a large proportion of the sparrows in some localities and is in some cases fatal. Dr. John C. Phillips writes from Wenham that many English sparrows died there during the summer of

1912. The organism of the disease was identified by Dr. Tyzzer of the Harvard Medical School. This disease manifests itself in a white diarrhœa which when introduced among poultry destroys turkeys and young chickens. It is, no doubt, distributed widely among poultry yards by the sparrow.

Mr. J. F. Mellus of Wellesley, whose success in attracting birds was mentioned in my last report, has been unable to secure purple martins, but has lured to his place an additional pair of tree swallows each year for three years, which have nested on his premises. Many bluebirds have been reared in the bird houses. He plants sunflowers for the nuthatches, chickadees and goldfinches, and has counted as many as 70 goldfinches about the place at once. Notwithstanding the general scarcity of birds in 1912 he had more birds than ever before, including a scarlet tanager which is the first that has come to his place. He attributes much of his success in attracting native birds to his efforts in destroying English sparrows. He killed 54 sparrows in 1909, 180 in 1910, 86 in 1911 and 95 in 1912, or 415 in four years. By November, 1913, he had killed 94 more, mostly with a 22-caliber rifle. He made a trap cage similar to that illustrated in my annual report for 1911, and lent it to a friend who caught several hundred sparrows in it. He has planted a weeping Russian mulberry and other plants to attract the birds. On Nov. 9, 1913, he writes, "The nuthatches have been coming to my feed boxes all summer, using the sunflower seed that I keep in it all the time; and the bath, which is only 13 by 15 inches, has been used by birds all summer." He counted, one afternoon, 35 field sparrows and "ground sparrows" that were washing at the bath, a few at a time, and 16 bluebirds, all of which were in sight and were using the bath from time to time. Goldfinches and rose-breasted grosbeaks also have used the bath or the feed box in which he keeps sunflower seed, hemp seed and millet. He puts out cracker crumbs every day for the native sparrows, and they come regularly to get them, sometimes eating two or three crackers a day. As many as 75 have been seen at one time.

He finds that the cat is now the greatest enemy of the birds. In some houses in his neighborhood two cats are kept, in others three, in one seven and he counted seventeen in a cellar of a house near the woods. There was a wing of a freshly killed flicker on the floor at the time, — all that was left of the bird.

Mr. Clayton E. Stone of Lunenburg makes his own nesting boxes out of hollow limbs. A few were made from an old wooden pump. He has very few English sparrows, and has been very successful, having had 30 nesting boxes in place on his farm in 1912, more than 20 of which were occupied. The number was not quite so large in 1913.

Mrs. E. O. Marshall of New Salem has a feeding table for birds. She finds that hemp seeds are very attractive to purple finches and that the chipping sparrows prefer Japanese millet seeds. Many birds are fond of cheese curds. Pine grosbeaks like hemp seed and frozen apples or pieces of unfrozen apple. A brush heap near the food table, purposely built, gives the birds cover to which to retreat in case of danger, and they go to the food more confidently. They also fly to the brush heap to dry after a bath. In a paper read before the American Ornithologists' Union at its last congress in New York City, Mrs. Marshall gave some interesting observations in regard to utilizing birds to protect the nests of other birds. In the early spring of 1910 her cat was confined and other cats driven away, while waste crumbs, suet crumbs, doughnut crumbs, millet and hemp seed were supplied about twice a week on stones, in the pasture, at the birds' table near the house and on the window shelf. The robins did not eat suet tied to trees or from the boxes against the trees, but some of them picked up the crumbs of suet from the ground. Some 30 blue jays were fed (with some misgiving) all winter. They came for food even to the windowsills, and the problem then presented was how to protect the nests of the small birds against the jays, which remained in the neighborhood during the summer. A large number of robins, finding conditions favorable, nested on the place, while on a neighboring estate, where three dogs and three cats were kept, practically no birds nested. The robins on the Marshall place were so numerous that they were able to protect not only their own nests but those of other small birds against the jays. Red squirrels which had been abundant were shot. Crows were somewhat numerous and destructive, but by placing cotton strings and other nesting material upon some branches two kingbirds were induced to nest, and they drove away the crows thereby protecting not only their own nest but those of the smaller birds in the vicinity. There were 21 robins' nests in the summer of 1911 and 40 nests of other birds, where in 1910 there had been only one robin's nest and very few of other species. The latest robins' eggs were hatched in August, 1913, after the young kingbirds were out of the nest. It was decided then to add scarecrows to the defences of the robins' nest, as it was in a conspicuous position, and to change the scarecrows often, in the hope that this would puzzle and alarm the crows. First a glass jar was hung on a stick near the nest and bottles were placed about on the grass. Next, newspapers were spread out on the grass with stones on each corner. Later, white strings were stretched about the tree, and later still white cloths were tied to the twigs to wave in the wind. The young birds were brought off successfully.

There seems to be some reason to believe that if meat and suet is furnished for blue jays in spring and summer as well as in winter they are not so likely to attack eggs and young of other birds. The experiment is well worth trying.

Miss Mabel E. Stevens of St. Johnsbury, Vt., writes that she feeds large numbers of birds daily, and is never troubled by insects in her garden "because it is the birds' home." Miss Heloise Meyer writes from Lenox that she has not yet sprayed her trees and hopes not to be obliged to, because the suet she has put out during the winter has brought so many woodpeckers that the trees are in very good condition.

Mr. W. M. Hoxsie writes from Canonchet, R. I., January 28, that he has 38 nests of eaves swallows, and that birds have increased in numbers in all his bird houses. There are 15 nests of barn swallows, 13 nests of robins, about 40 nests of tree swallows and a long list down to three pairs of house wrens. Very many other correspondents are engaged in similar work, but not all are so successful.

Town Bird Wardens.

The Legislature of 1913 passed a law (chapter 296) permitting towns and cities to appoint and pay bird wardens. Under the statute a bird warden is expected to protect and increase the number of insectivorous birds as far as possible, and to assist citizens in their efforts in the same direction. The act was passed so late in the season that it could not be taken advantage of at the town meetings, but the town of Dover, Mass., at an adjourned town meeting, appointed Mr. William F. DeMerritt as town bird warden for the year. The selectmen of Dover have issued the following statement to citizens: —

> The town of Dover has the first town bird warden in the United States, Mr. William F. DeMerritt. His business is to protect and rear our wild birds after the manner of large and successful experiments in Germany, and later in England, and thus in this natural way stop the ravages of insects and make unnecessary the hopeless fight in which Dover has spent thousands, and the State and nation millions, of dollars.
>
> In order to make the experiment a successful one every citizen of our town must co-operate with the warden. You can help in the following ways: —
>
> *First.* — By giving permission to the warden to post your land against gunners, trappers and snarers.
>
> *Second.* — By telephoning to the warden, Dover 7–4, when you see or hear gunners in your vicinity, and by writing if you know of any trapping or snaring or of any offence against the game or bird laws.
>
> *Third.* — You can inform the warden of the presence of red squirrels anywhere in town. These are among the greatest enemies of the birds. Do not try to dispose of them yourself unless you are an expert with a gun. The warden should be notified of the presence of crows in nesting time. They destroy large numbers of nestlings.
>
> *Fourth.* — You should inform the warden of any stray, wild, unowned or unfed cats in your vicinity. Cats, like red squirrels, are among the most destructive enemies of birds we have, especially about our homes. Therefore —
>
> *Fifth.* — You should try and get on with as few cats as possible. And in bird-nesting time, from April 20 to July 1, keep the family cat caged from 5 P.M. to 7 A.M. the following morning. Then feed abundantly — some meat is desirable — before letting out for the day.

Sixth. — With the family cat thus restrained you can invite birds to nest and live on your premises and about your home by using the methods about which the bird warden will be glad to inform you. He will direct the form and location of bird houses, feeding tables and so on, and will furnish the houses at cost, if any are desired.

The people of the town of Meriden, N. H., have turned their whole town into a "bird sanctuary," doing voluntarily and successfully something of what we are going to do here.

Let us make the movement in Dover an enthusiastic and united one, and furnish for the whole country an example to be followed.

Too much must not be expected the first or second years, but experiments made by Mr. Lord in our own town and by Mr. E. H. Forbush, our State Ornithologist, show that in a short time the number of birds around our homes can be greatly increased, and insect pests as greatly decreased.

The bird warden is engaged in making nesting boxes and in trying the most approved methods for protecting and attracting birds and giving this information to citizens. He has been appointed a Deputy Fish and Game Commissioner, and so has authority to warn or arrest violators of the law. It is hoped that other towns and other States will profit by this example.

THE STARLING.

In the report of the State Ornithologist for 1912 it was predicted that the European starling would be found sparsely distributed over the greater part of the Commonwealth before the end of the year 1913. This prediction has been verified. Mr. Harold W. Copeland records the first starling in Bridgewater, Plymouth County, Mass., on Jan. 6, 1913. Later, five more were seen.[1] On January 24 Miss Catherine R. Buckley of the Burroughs Nature Club wrote asking if it was probable that a bird seen by one of the members at Rumford, Me., could have been a starling, as it answered the description of that bird.

On March 17 Rev. Robert F. Cheney wrote that he had seen at least three starlings in Southborough, Worcester County, Mass. On April 9 Mr. Wm. P. Wharton of Groton, Middlesex County, wrote that a pair of starlings which had established themselves at his home had ousted a pair of bluebirds from a nesting box and started there a nest of their own. On May 8, 1913, Miss Inez A. Perry wrote from Sudbury, Middlesex County, that a pair of starlings there had young in a hollow branch of an apple tree.

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[1] See also "Bird Lore," March-April, 1913, p. 114.

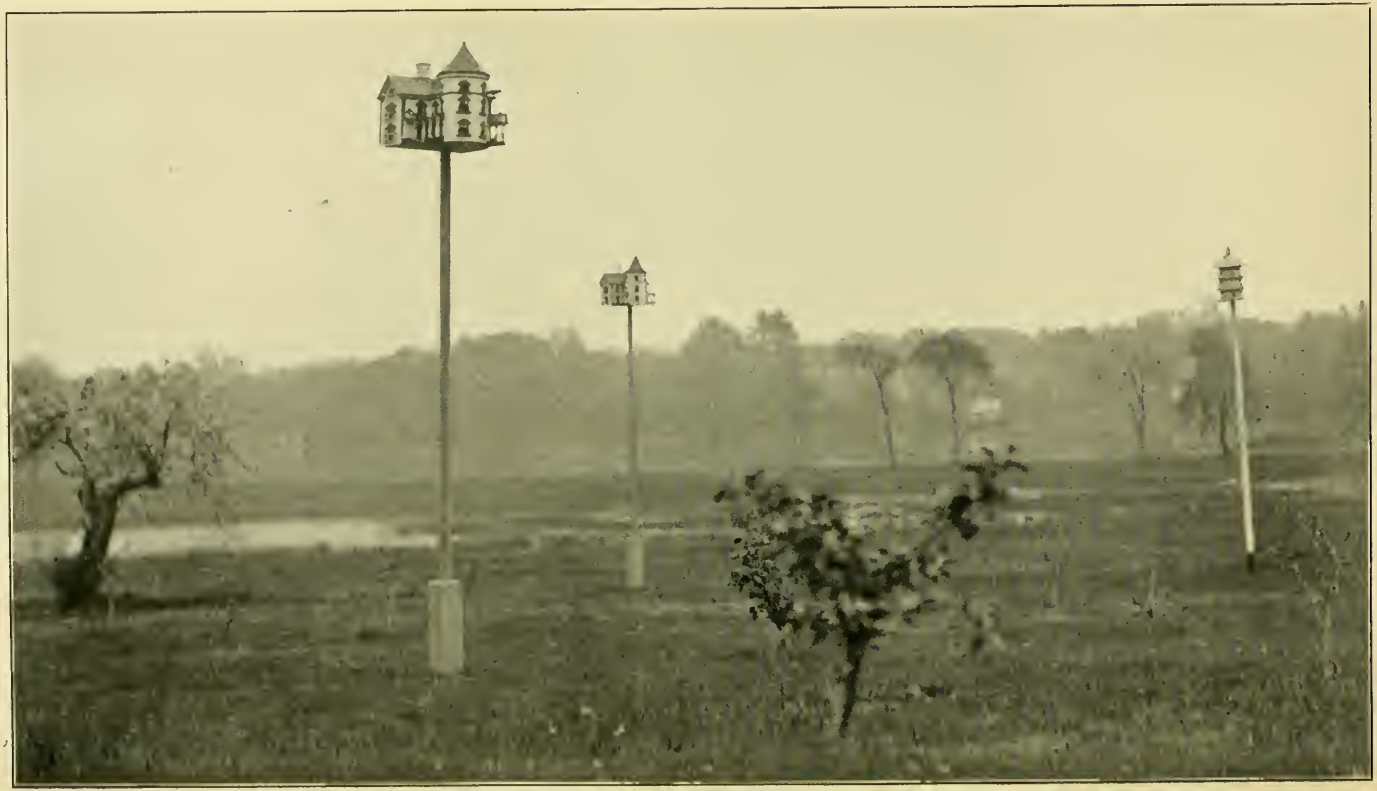
These are a few of the more definite data in regard to the spread of the starling in Massachusetts and beyond. During the spring and summer many people from various parts of the State have inquired about birds which from the descriptions given could have been none other than the starling. While these inquiries cannot be set down as definite records, they indicate that the bird is sparsely distributed over a large part of the State, and has already extended its lines to parts of Vermont, New Hampshire and Maine. It has become well established already in Rhode Island, in the Connecticut valley, both in Massachusetts and Connecticut, and over the greater part of Connecticut.

In the late fall and in December starlings were reported to be flocking about church steeples and in marshes, particularly about the Cambridge marshes. Mr. Edward H. Atherton informs me that Mr. Horace W. Wright has counted 73 birds in one flock there.

Now that this unbidden guest has invaded the greater part of the State and has come to stay, it remains to be decided what attitude the people of the Commonwealth are to take toward it.

There is much conflicting testimony regarding the starling in its native land, and while it is generally considered a beneficial bird it often commits great havoc, particularly on the fruit crops. Interference with native birds and destruction of grain and fruit by the starling have led to the removal of protection from it in New York, Connecticut and Vermont. Complaints from fruit growers will probably lead to such action by the General Court of Massachusetts in 1914, but so far as the insect food of the starling is concerned it is a beneficial bird. In fields where its numerous flocks alight to feed, entomologists assert that the pupæ of certain butterflies, formerly common, have disappeared.

The bird has the reputation of feeding on some destructive tree caterpillars, but if in this country it attacks the



Martin colony on the estate of Edward L. Parker at Concord, Mass.

hairy species, such as the tent, the brown-tail or the gypsy caterpillar, this habit has not yet come under my observation. It is recorded, however, that in an invasion of the spruce moth (*Liparis nonachaa*), which occurred in Bavaria during the years 1889–91, great flights of starlings collected and fed on its caterpillars which are hairy but not so disagreeably so as are those of the gypsy moth. In one locality alone the number of starlings feeding on the caterpillars was estimated at 10,000. At that time the attraction of starlings to such centers became so great that gardeners felt their absence seriously in different parts of the country.[1]

Mrs. H. J. Bradley of Chelsea writes that the starling is the only remedy for the brown-tail moth. She states that she was brought up on an English farm on the estate of the Duke of Rutland. The starling, she says, is noted there for its insect-eating propensities, destroying all kinds of slugs, caterpillars, moths, etc. She asserts that the farmers there look upon the starling as a blessing; that she has seen trees swarming with caterpillars cleared of every one by these birds, and that on the Duke of Bradford's estates there are all kinds of fruit trees, and the starlings do not interfere with the ripening of the fruit, but during the vacation season, when the fruit is ripe, boys are hired to make a noise with great clappers to frighten the birds away. In other words, care is taken to keep both the birds and the fruit. Time will show whether the starling is to be of any service here in ridding the country of the gypsy and brown-tail moths. If it will undertake that office it will soon have many friends, and much may be forgiven it.

Attracting the Purple Martin.

Any great increase in the number of starlings may make it difficult for the martins to re-establish themselves, as many starlings remain through the winter and are likely to take the martin houses before the martins themselves come in the spring. Those who have attempted to bring back the martins in Massachusetts have had trouble enough already with one foreign enemy, the house sparrow, commonly known as the English sparrow, which has driven the martins away from many boxes put up for their accommodation. Bluebirds and tree swallows also have been known to drive martins from nesting boxes, but the starling will be able to evict all three. Success with martins will depend on establishing them within a very few years before the starlings become generally numerous. Thus far the attempts to colonize martins in Massachusetts have not met with much success, but some people who have been well located for this purpose and who have persevered have succeeded.

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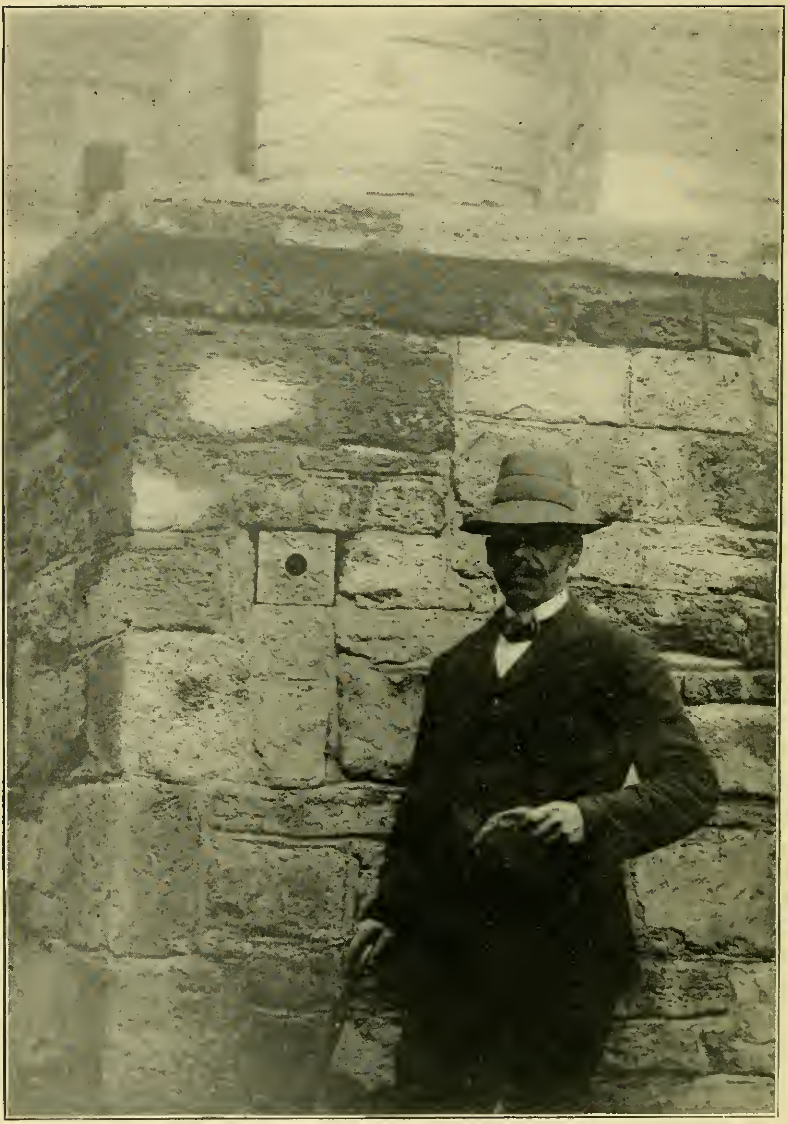
[1] Fürst Hermann, "Protection of Woodlands." English edition translated by John Nisbet, 1893, p. 126.

Mr. Edward L. Parker of Concord, Mass., who reported 6 martins in a Jacobs' martin box in 1912, believes that the number increased to 8 or more before the end of the season. It is interesting to note that on April 6, 1913, on a bleak day, with the wind northeast, with the sun shining only at times, a single male purple martin came to the bird house about midday. In the afternoon the wind changed to the northwest and blew hard. There was a snow squall and it was much colder. The bird remained all day and probably stayed in the house that night. On April 7 there was a bleak north wind, with the mercury at about 32° at 8 A.M.; the ground was covered with snow and it was snowing briskly. The male martin was seen flying in the storm. There were heavy snow squalls during the day, but the sun shone at times. In the afternoon it snowed hard for about twenty minutes, the mercury dropped to 32° and stood at 28° at night. On Tuesday, April 8, no martin was seen up to 7.45 A.M., but two minutes later one was seen to come out of the martin house and two were seen about 6.30 P.M. These martins disappeared and were not seen again. Late in the summer, after the birds had left the house, one dead adult martin was found inside. No more were seen until April 13 when two appeared. The number increased until May, when at one time at least 40 martins were in the house. Another house was put up and a dozen or more birds remained and nested. The martins all left before the 5th of August with their young.

Mr. John H. Sage of Portland, Conn., who put up a Jacobs' bird house for martins in 1910, saw the first martin



Exterior view of one of the cement nest boxes which are set into the walls of the castle at Seebach. (Photo by William P. Wharton.)

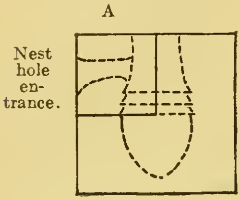
of the season at his box April 25, 1913, and a pair began building on the 29th. For the two previous seasons they had been coming to the box, but had shown no disposition to nest. On the 28th of May he wrote that he had 8 martins in the box, and the new arrivals commenced to build immediately. Also those that came early apparently had young. Early in July there were young in the nests, and on July 24 some of the young had left. There are now flourishing colonies of martins in Concord, Hyde Park and Taunton, Mass., and there are said to be some in several other towns. It may be well to repeat what has been said in reports of the previous years, that success in securing martins depends largely upon having the rooms in the martin houses of the right shape and size, and in having an entrance large enough. It has been generally understood that martins require unventilated rooms, but Mr. Joseph H. Dodson of Chicago, who has experimented with martin houses and has the attic rooms arranged so that the birds can go in at one side and out at the other, says that the birds invariably build in the two attic rooms first. This ventilation allows the air to pass through the upper part of the house, but he states that all the rooms in his houses are ventilated. During recent hot summers many birds have died in unventilated houses, and ventilated nesting boxes for birds of all kinds have given better results than those unventilated. New martin boxes put up early in the season in localities where no martins have nested should be kept closed until May, when the young martins or "new settlers" have come. This will give them at least an equal chance with the sparrows. No sparrows should be allowed to nest in the same bird house with the martins, for when both species nest together the sparrows will sooner or later drive out the martins.

Recent European Experiments in protecting Birds.

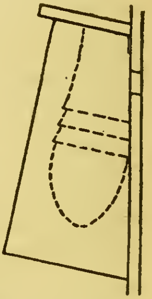
Mr. William P. Wharton of Groton, who traveled in Europe during the summer of 1913, paid a visit to the estate of the Baron von Berlepsch, at Seebach in Thuringia. This estate is now used as a bird-protection experiment station by the government, and Mr. Wharton had an opportunity to observe some of the recent experiments made there under the

Baron's supervision. Mr. Wharton's observations are summarized below from a letter written while he was abroad: —

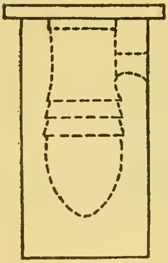
Nest boxes have been inserted in the stone walls of the castle in the form of stone blocks in about 100 places. These are made in two parts, thus (see cut). The block "A" can be withdrawn at any time to inspect the interior. These nesting sites are very largely occupied by starlings.



In the top stories of the castle, where the walls are of one thickness of boards, Baron von Berlepsch has cut entrance holes in the walls, and hung his regular boxes inside, with a slanting slab sawed off the front (see cut). These he believes are more readily occupied than when hung outside the building, and are easy to inspect. An iron strip is nailed across the top of the opening made by the saw cut, with a notch cut in the middle of its lower side, into which a nail, driven in the wall, fits, so that the box hangs on this nail and can be quickly removed and replaced. The Baron plans to have such boxes made with window glass set in the back opposite the nest, so that he may study the feeding of the young birds in the dark. He has a theory that they display some sort of phosphorescence to guide the parents.

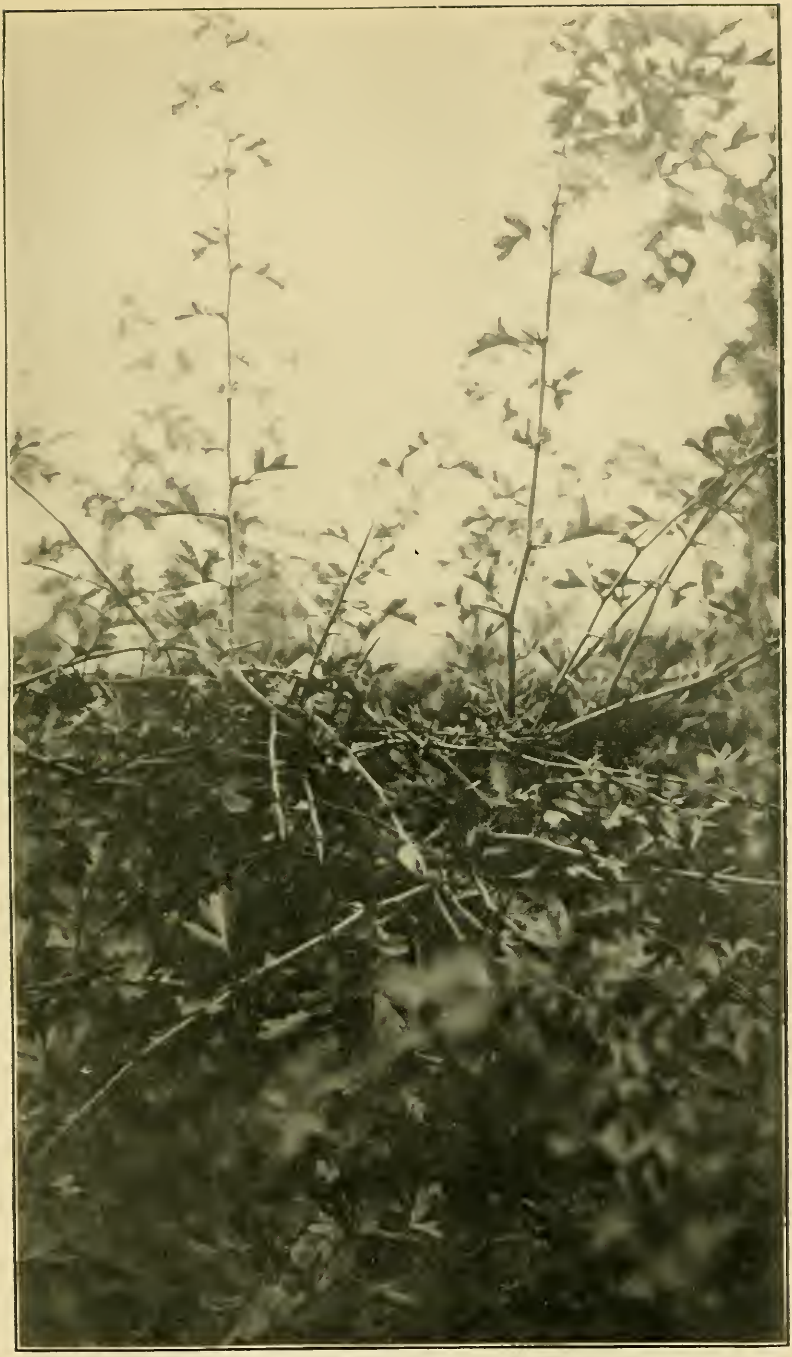


Many nesting boxes in the park had cement tops fitting into the top of the bored-out limb (see cut).



The "shelter woods" plantations of different ages are divided into three kinds: those in the park, primarily for beauty (generally under considerable shade); those in small patches of woods, primarily for the protection of the woods; and those primarily for the protection of birds.

1. The undergrowth in the park is largely modeled on the regular shelter wood, and the thorn (*Cratægus oxycantha*) the Baron considers the best thorn for



Pruned nest platform on thorn bush at Seebach. The birds often nest on such whorls resulting from this pruning. (Photo by William P. Wharton.)

pruning purposes. Horse-chestnuts (*Æsculus hippocastanum*) and privet (*Ligustrum*) are pruned to make nesting sites at various heights; many bushes are tied together for this purpose, and many of both kinds hold nests of this year.

2. Plantations under considerable shade naturally showed considerably less growth than those in the open, and perhaps less nests. In heavy shade the privet, horse-chestnut, and to some extent the yew (*Taxus baccator*), do well as "stock bushes."

3. Plantations primarily for the birds were perhaps the most interesting. These were of various ages and stages of development. The branch platforms for holding nests were developed to a high degree, and very many were used by birds. In the first pruning for this purpose the cut is made just above the ring where the growth began, a year or two years before cutting. This causes the shrub or tree to throw out many shoots in different directions in about the same plane. Thereafter these "whorls" are cut annually from a point perhaps one-half an inch to one inch beyond the point of the beginning of the growth of the previous year, for the purpose not only of further enlarging the platform, but also of keeping the leaf screen close about the nest from year to year. It is the best plan at the end of the season to throw down all nests in the whorls as well as from the boxes.

Almost all the older plantations are connected with each other and with the parks by some kind of a hedge or row of trees. The plantation last set, however, lies in the midst of extensive grain fields probably 300 yards from any wood. This is to some extent experimental, to test the willingness of the birds to use such an isolated spot.

The "hedge of firs" (in this case *Picea excelsa*) is topped every five or six years. Herr Schwabe, who is directly in charge of this work, gives it as his opinion that it would be better to cut the leading *tips* only each year in August, which would then tend to form side eyes for the following year's growth, thus keeping the trees low with less heavy cutting than is now practiced.

The rows of poplars pruned in the manner described in

Hiesemann's book[1] showed many nests, averaging fully one to every tree and probably more. These are pruned every six years *back to the trunk.* In the case of the lindens (*Tilia parvifolia*) the pruning is done a foot or more away from the main trunk, and some excellent nest platforms formed. There is no undergrowth among these rows of trees, which border a brook.

The Hainich Wood (about 6 miles distant) is the place where birds prevented the defoliation of surrounding forests by insects in 1905 from spreading into that of Baron von Berlepsch. This is composed in the main of pure spruce and almost pure beech stands. Among the beeches the nest boxes are plentifully distributed, but at least 30 paces apart. They are said to be practically all occupied by birds, probably the majority by titmice. In the spruce woods the boxes are located only at small openings, as most of the forest is in dense shade. At these points an experiment is being conducted with four boxes, one being an earthenware one, the rest regular von Berlepsch boxes; one with a 32 millimeter opening (Box A), another, Box B, with a 46 millimeter opening, and a third being built exactly like Box B in every respect except that the hole is the same size as that in Box A (32 millimeters). So far the indications are that the last is much preferred by the smaller tits to the others. The earthenware box is considered of no value. Probably it is too good a conductor of heat.

There is a small orchard of old apple trees, entirely uncultivated, about the forester's house at the Hainich Wood. On these trees there are many nesting boxes, often two on each tree (of different sizes), and these, Herr Schwabe says, are frequently both occupied the same year by different species of birds.

The show spot on the estate is a thorn hedge along the edge of a small wood, every bush of which has been pruned for nesting purposes. Mr. Wharton examined about 300 feet of this hedge and counted 31 nests in that portion.

The above, condensed from Mr. Wharton's notes, if used

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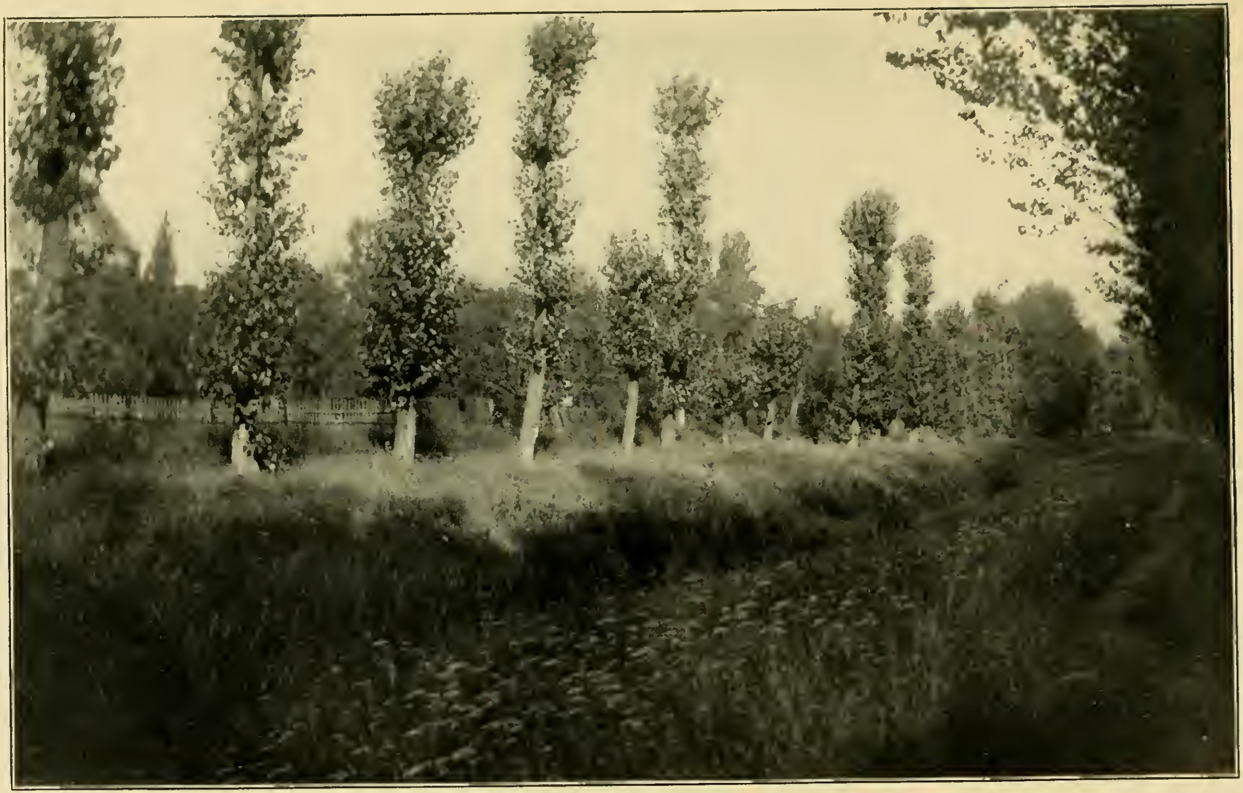
[1] Martin Hiesemann, "How to attract and protect Wild Birds." English edition, translated by Emma S. Buchheim, 1912.



Row of poplars pruned for nesting sites. There is at least one nest in practically every tree in this row on the estate of the Baron von Berlepsch. (Photo by William P. Wharton.)

in connection with the book,[1] gives an excellent idea of some of the successful methods used by the famous ornithologist, Baron von Berlepsch.

Birds and Insect Pests.

Mr. R. A. Frye, writing from San José, Cal., March 17, 1913, says that on a visit to the place where he was born, in southern New England, and where he lived for twenty-five years, he was so much impressed by the comparative absence of robins and other birds that he wrote on his return to California to the secretary of the National Association of Audubon Societies to inquire whether this was a recognized condition, and if so what reason was to be assigned for it.

A scarcity of robins and other birds in New England was noticed particularly in the summer of 1912, and it was predicted then that an increase of insect pests would occur the following year. In 1913 forest tent caterpillars appeared in very unusual numbers in many localities. The tent caterpillar was tremendously prevalent over the greater part of Massachusetts, and the loss to the apple crop of the State, where farmers neglected to care for their trees undoubtedly amounted to several hundred thousand dollars. Reports of an increase of insect pests came from the south also. The cotton boll weevil was working east into Georgia, and the wireworms were spreading terrible havoc through South Carolina. Boll worms were more destructive than at any time in the memory of the oldest inhabitant, and the late corn crop was riddled. The south has been sorely stricken not only by insect pests but by various fungous diseases conveyed from place to place largely by insects. The pine bark beetle, which ruined a large part of the pines in Virginia and West Virginia in 1894, has been moving down the Appalachians until Georgia and South Carolina pines are dying by thousands. The onward march of the beetle has been checked in some places by the yellow-bellied sapsucker, which is generally regarded as a destructive bird.

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[1] Martin Hiesemann, "How to attract and protect Wild Birds." English edition, translated by Emma S. Buchheim, 1912.

Much complaint comes from New England farmers regarding depredations by blackbirds upon corn, and a great deal of damage has been done, particularly in Massachusetts and Connecticut, on places where sweet corn is grown for seed. Many farmers are seeking to destroy these birds. The shotgun and poison have been resorted to, and last year the Connecticut Legislature passed a statute allowing the killing of blackbirds when engaged in destroying corn. It would be wiser to protect both birds and corn. The Goshen, Ind., "News-Times" states that Charles Briner, well known in Elkhart County, says, "Spare the blackbirds." During the fall of 1912 he noticed swarms of blackbirds in his cornfield, and took special pains to see whether they were destroying the corn or "bud worms." Invariably they killed the latter by hundreds. He watched them carefully and saw them extract the worms. In the southern States the bud worm, or boll worm, is one of the greatest pests on growing corn. These corn pests are gradually working north, and Mr. Briner says that every farmer should guard every natural friend to his growing crops. A farmer in Concord, Mass., put out poisoned grain for blackbirds in the fall of 1913, and apparently many grackles or crow blackbirds were destroyed in this way. On July 4, 1913, Mr. Wilfrid Wheeler, Secretary of the State Board of Agriculture, who lives in Concord, noticed that grackles apparently were eating the cherries from his trees. He shot one that flew out from the cherry tree and examined its stomach. He found it packed with the remains of the tent caterpillar moth; also there were three grasshoppers, three or four small caterpillars, possibly cutworms, and no cherries.

Mrs. Mary R. Stanley of North Attleborough reports that a male bluebird which was feeding its young in a bird house on her place appeared to be living entirely on the elm-leaf beetles, but did not take them to his young. This beetle is one of the greatest pests of the elm in Massachusetts and has destroyed many fine trees.

Rev. William R. Lord of Dover, Mass., states that the authorities there have been cutting wild cherry trees because they harbor tent caterpillars. Mr. Lord declined to have the trees on his estate cut, and the caterpillars did very little harm there because he had made his place attractive to native birds. In the fall of 1913, however, many tent caterpillar moths deposited their eggs on his trees, but in late November, when he examined the trees, he found that birds, presumably chickadees, had removed nearly all the egg clusters.

Mr. B. A. Arnold, who summers at Northeast Harbor, Me., writes that in that vicinity and in many places in Maine the spruce worm [1] has become quite abundant, so much so that people are beginning to fear the destruction of the spruce. Warblers and titmice feed voraciously on these insects, but Mr. Arnold says that the red squirrels, which are becoming abundant in the Maine woods, protect the moths by destroying the eggs and young of the warblers and other small birds which feed on insects. For example, he states that his cottage is situated on a point extending into the sea and connected to the mainland by a somewhat narrow neck. The point is covered with spruce trees, and the worms and moths were quite abundant on the point in June. Knowing that the squirrels destroyed the warblers' eggs and young he had the squirrels killed off, and several families of young warblers were reared in a short time and the spruce trees were cleared of worms and moths. At almost any time of the day one could look out and see the little warblers flying from limb to limb in search of their food. In confirmation of his belief he states that there are several small islands in the Georgian Bay, Lake Huron, on which warblers nest very abundantly. These islands are very small and squirrels do not find food enough to live there. On one island of hardly an acre there are apparently from six to ten pairs of warblers nesting, whereas on the mainland, only a few hundred feet away, where the vegetation and nesting conditions are practically identical, it is hard to find any.

The Killing of Birds by Immigrants.

Recently it has been reported that some immigrants make a practice of taking young birds from their nests for food. Evidence of this has at last been obtained. Mr. Wilbur

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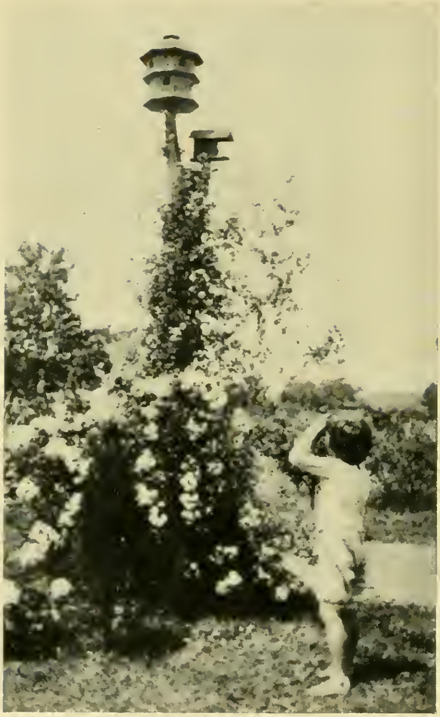
[1] The larvæ of several species of Tortricid moths are destructive to the spruces at times.

Smith, chief game warden of Fairfield County, Conn., has convicted an Italian of killing and eating unfledged young robins. The man was seen frying young birds over a fire near his shack. They were fried without removing the heads or legs. Mr. Smith was shown by the Italian himself the nest from which the birds were taken and four little heaps of feathers where they were plucked. No one knows how many nests of young birds are despoiled in this way. The birds are left in the nest until they are almost ready to fly and then taken and eaten, as squabs are eaten by the epicure.

RECENT NOTES ABOUT THE ENEMIES OF BIRDS.

Mr. G. K. Noble visited the Nantucket bird reservation on Muskeget Island during the summer of 1913, to examine nesting colonies of sea birds there. He found there, as he believed, about 45,000 birds, including common, roseate and arctic terns and the laughing gull. In the "Warbler" of Sept. 1, 1913, he tells of the danger which menaces the birds. "Thoughtless owners," he says, "have abandoned their cats upon this island." Gruesome sights were soon brought to his attention. Many of the birds had been killed while sitting on their eggs and their bodies still partly concealed their decaying eggs. Dead mother birds, their bodies partly eaten, appeared at every step. He says that on the extreme westerly part of the island the gulls and terns have been exterminated, and evidence of their futile attempts at nesting may be seen in the white feathers and bleached bones visible on all sides. As the young hatch out they also become the victims of the ruthless cat. It was a common sight to see during one short walk across the island at least 50 young, dead or dying, with their heads cruelly lacerated and their wings crushed and bleeding. It seems that the cats kill young birds simply for the sport of it. Mr. G. E. Coffin, the warden, is an expert shot, and is on the lookout for the cats, but the scanty vegetation on the island offers the hunter little protection and gives the cats all that they need. The warden killed three cats in ten days, but Mr. Noble says that at least five times as many of these semi-wild cats are still left



Device to keep cats away. A thorny Dorothy Perkins rose trained to grow up the pole. (From "Our Dumb Animals.")

on the island. If these cats be not exterminated they probably will increase and exterminate the birds, as that has been the result wherever cats have been liberated upon sea islands.

To protect Birds against Cats.

The Dundee (Scotland) "Advertiser" states that cats are terrible poachers and destroy numerous young birds, and the French National Society of Acclimatization has taken up this cause of the destruction of game and birds, and has tried to find a remedy for it. The society now informs us in its Bulletin, says the Advertiser, that in order to keep the cats away from a bird's nest we have only to place a cloth or rag saturated with "animal empyreumatic oil" in the bush or on the trunk of the tree where the nest is situated. Cats have an invincible repulsion for the smell of this oil. One correspondent having caught a mouse in a trap rubbed it over with empyreumatic oil and then let it go in the presence of his cat. The cat took no notice of the mouse. Whether the odor had been caught by the other mice in the house, or whether the cat kept a disagreeable reminder of the experience, he absolutely gave up chasing the mice which swarmed in the house. This method may be worth a trial in Massachusetts.

Mr. J. W. Barber gives the following suggestions in regard to protecting bird houses against cats: —

> Get from any pipe dealer a flange, say 6 inches long, the size adopted for the standard; have it bored for three or four holes and screw to the bottom of the bird house. Set an iron pipe (galvanized preferred) in the ground far enough away from any trees to prevent a squirrel from jumping from the tree to the top of the bird house, and screw the flange on the end of the threaded pipe. If the pipe is of a different diameter from the bore of the flange a "bushing" can always be obtained to make the sizes the same.
>
> To employ the ordinary wooden rod for the standard on which to set the bird houses, it is simply necessary to tack at a convenient height, above where any person can reach, a row of fishhooks completely surrounding the pole, or, if assurance is wanted "doubly sure," two rows, each row opposite to the other, but very near one to the other.

This is the plan adopted by the Indians and others in the great Canadian prairies for the "caches," covering the cache for protection from the birds, and the row of fishhooks with the barbs pointing downward nailed to the isolated tree used for the cache. Of this Ernest Thompson-Seton speaks in his "Arctic Prairies" (I think that is the name), so neither he nor I can claim any invention in this plan.

The plate which faces Page 266 was reproduced in "Our Dumb Animals." It was taken from a photograph by Mr. Ralph Waldo Trine, made in his garden at Croton-on-Hudson, New York. He had maintained bird houses for some time and it was a serious problem to keep the cats away from the birds. Mr. Trine therefore resorted to the plan of growing a Dorothy Perkins rose bush about the pole. When the bush was well grown, the thorns kept cats from climbing the post, and added to the attractiveness of the bird house as the rose bush concealed the bare unsightly pole. Bird houses on poles are preferred by many birds to those on trees.

Noteworthy Flights of Birds.

The greatest flight of egrets on record in Massachusetts occurred in 1911; but the number summering here in 1913 must have been nearly as large, and they were distributed over a much larger area. Many reports of the presence of white herons, cranes and storks were received from people unacquainted with birds, but authentic records were received from Berkshire, Hampshire, Worcester, Plymouth and Dukes Counties. These birds probably were all egrets, and must have wandered north after the breeding season.

A flight of Holboell's Grebes came in during the cold weather in February. These birds were picked up on the snow and ice from western Connecticut, through central Massachusetts to Middlesex County. Probably they were driven out by the ice from the lakes of central New York, and failed in their attempt to reach the sea.

A small flight of evening Grosbeaks was noticed in central Massachusetts in January, and another in eastern Massachusetts the latter part of December.

FOURTH ANNUAL REPORT

OF THE

STATE INSPECTOR OF APIARIES.

Presented to the Board and Accepted,
January 15, 1914.

FOURTH ANNUAL REPORT OF THE INSPECTOR OF APIARIES.

To the Honorable State Board of Agriculture.

I respectfully present the fourth annual report of the State Inspector of Apiaries for the fiscal year 1913.

The active season in the apiary during 1913 revealed several features peculiar to that year. The long-protracted drought materially handicapped successful operations, even under normal conditions. Throughout the country it was the general experience that the honey crop was considerably lessened, probably by the lack of sufficient moisture to enable proper growth of nectariferous plants. This was especially true east of the Mississippi River. In Massachusetts some fair crops were obtained locally, but it cannot be said that the season was in any way favorable to honey production. This fact increased the difficulty of successful building-up and maintenance of colonies, and made them more liable to the ravages of disease. More care and attention are due colonies under treatment during adverse climatic conditions; those who fail to give proper attention and necessary nutriment experience difficulties.

The protracted fall has revealed that the bees consumed early a considerable portion of their winter stores, which may result in unsuccessful wintering or starvation during the current winter of 1913–14.

Summarily, conditions throughout the State have shown improvement. Several local outbreaks of infection were discovered, and it is thought surrounded or checked. The older and known infected districts have been closely guarded. It is noticeable, too, in those districts where disease was once bad, that the present percentage of reinfection is apparently slight, and in a locality where a few years ago practically all the colonies were found infected, to-day this infection has been reduced or held in check until but a small percentage of colonies are now found diseased. Furthermore, thrifty beekeepers have learned to rid themselves of disease as soon as it makes its appearance in their yards. Experience shows, moreover, that reinfection may often be attributed to careless or thoughtless methods.

Diseases of the Year. — It is becoming more and more pronounced that American foul brood is being materially lessened or decreased throughout the State. But 32 apiaries showed infection with this disease, 27 of which were satisfactorily treated before the season closed.

European foul brood has a country-wide reputation for treacherousness and persistence. It seems to be sporadic, fluctuating and difficult to diagnose in its early stages. For years it has been recognized as a disease which spreads with great rapidity, and one which is difficult to combat or suppress. On the other hand, its ravages are perhaps less fatal than those of American foul brood, especially where intelligent methods are employed. The inspectors throughout eastern United States found European foul brood particularly plentiful during the year 1913. Moreover, it seems especially virile and active. The peculiar weather conditions doubtless had their influence. There were found in Massachusetts 214 apiaries infected with this disorder, of which 169 were released, having complied with the inspectors' instructions prior to the close of the season.

Sacbrood, which was formerly known as the so-called "pickled brood," was found in 23 apiaries. This disease, while it reduces the efficiency of the colonies in which it is present, is not thought to be serious, and usually rectifies itself, especially with the introduction of a new queen. It is, however, a specific infection, being activated by a so-called "filterable virus."

The office has received a considerable number of samples of brood and comb for diagnosis, which reveals the active interest of the beekeepers in checking infection which they have thought occurred in their yards.

The service has been facilitated by means of the "clean-up" card, reported the previous year. By means of this the beekeeper whose yard has been quarantined, or one who had been directed to clean up his yard from the standpoint of sanitation, communicated to the office by means of this card the fact that he had fulfilled the instructions left by the inspector. Upon receipt of the signed report, in the cases of quarantine, the quarantine was raised. It has been found necessary to limit with considerable discretion the time allowed for fulfilling instructions. Delays in reporting have been followed up from the office. In this way the office is kept in constant touch with the situations throughout the State. It has been found advisable to introduce an additional feature upon this report card in order to overcome certain slight objections heretofore experienced. The principle and purpose of the card will not be altered, merely its efficiency improved. Its efficiency is indicated by the ready response from approximately 350 beekeepers who signed and returned their reports in 1913.

There has been the usual reduction of beekeepers throughout the State, 229 having been removed from the file. This reduction includes those who have moved out of the State, died or for other reasons have ceased to keep bees. Many, however, have been recorded as new beekeepers, or added to the records. Besides these, a considerable number of names have been added as "prospective" beekeepers. Thus there has been an increase of 50 to 100 apiaries recorded.

Among the approximately 1,300 apiaries under observation during the season there were recorded by the inspectors losses to the extent of 753 colonies during the winter of 1912–13. This is approximately 17 per cent of the number of colonies (4,347) put into winter quarters. It will be observed that 17 per cent is a material reduction in the winter loss as compared with that for the winter of 1911–12, when the records showed approximately a 40 per cent loss. In some instances entire apiaries were found to have succumbed in that year.

Miscellaneous Work.

Correspondence. — The usual correspondence, with an estimated increase, has been handled. The inspector finds difficulty in this phase of the work from the fact that it is impossible to be in the field and to properly attend to correspondence simultaneously. Occasionally it has been necessary to obtain additional assistance as heretofore.

Publications. — The annual report of the Inspector of Apiaries for the year 1912 is Bulletin No. 6 of the "Apiary Inspection" series.

Resignations. — Mr. John Shaughnessy of Stockbridge was appointed Deputy Inspector of Apiaries on Jan. 28, 1913, to fill the vacancy caused by the resignation of Deputy Inspector Wm. H. Thatcher of North Adams in 1912. On Aug. 7, 1913, Deputy Inspector Irving W. Davis resigned. It was found impractical to appoint a successor during the current season.

Attendance at Meetings. — Besides presiding at the convention of the National Beekeepers' Association at Cincinnati, Feb. 12 and 13, 1913, where the inspector was elected president of that association, the writer has attended numerous conventions and meetings of beekeepers throughout Massachusetts and neighboring States. As usual, there have been numerous field and demonstrational meetings, as well as lectures given under the auspices of the inspection service of the State Board of Agriculture. The newly organized State Beekeepers' Association of Massachusetts is being developed and promoted as rapidly as circumstances and opportunities permit.

Emergency Meeting. — A most successful emergency field meeting under the apiary inspection service was held Saturday, July 19, 1913, at 9.30 A.M., at the Grammar School, Chester Station, Mass. The meeting was called because of an outbreak of European foul brood in that locality. From hurried examinations in adjacent towns, the infection had been determined as local and not widespread. It was therefore immediately desirable to check the progress of the disease. Furthermore, at that season it was quite possible to treat and save much of the infected stock. A program of lectures and demonstrations was carried out by Deputy Inspector John Shaughnessy and Inspector Gates. The meeting was hurriedly and widely announced by means of a special bulletin and through the courtesy of the press. It resulted in a representative attendance from all adjacent towns. The program included general features concerning the manipulation of apiaries, the procuring and shipping of bees in their relation to the transmission of disease, the nature of the brood diseases of bees, and the materials and method of treating these diseases. The subjects were fully discussed and demonstrated with materials, and living bees procured for the convention.

Immediately following the convention Deputy Inspector Shaughnessy carefully canvassed the territory and found the limits of the infection. It was concluded that the outbreak had been caused by the introduction of bees from another infected district. The results of the meeting, however, were especially marked, in that apiaries up and down the valley had been thoroughly cleaned and renovated even previous to the inspector's visit. Some beekeepers who were not in attendance at the meeting gained full particulars through acquaintances. This type of field meeting and demonstrational work is proving more and more successful.

"Soft Candy" Feed. — One of the features of the season has been the development of, and the wide expression of satisfaction in, a "soft candy" which is being found to be a most satisfactory food for bees. This candy was originally promoted and developed by Mr. O. F. Fuller, a prominent beekeeper of Blackstone, Mass. The office has been obliged to repeatedly furnish information concerning this candy by correspondence, and Mr. Fuller reports seasonal inquiries in large numbers. A full description of the candy, with directions for its manufacture, will be found in Appendix I. to this report. This appendix has also been published separately, and is now available for free distribution.

Information collected during the year concerning the interrelation of spraying and beekeeping, and the digest of spraying laws will be found in Appendix II.

The publication of the proceedings of the convention mentioned in the previous annual report has been delayed because of insufficient time and opportunity to edit and prepare the manuscripts.

FINANCIAL STATEMENT, NOV. 30, 1913.

Services of inspectors,	$1,117 50
Travel and necessary expenses of inspectors,	685 86
Postage,	13 16
Printing and office supplies,	54 57
Stenographic service,	100 00
Telephone and sundries,	28 91
	$2,000 00

Respectfully submitted,

BURTON N. GATES,
State Inspector of Apiaries.

APPENDIX I.

SOFT CANDY FOR BEES.

THE SO-CALLED "FULLER CANDY" FOR QUEEN CAGES, TRANSPORTATION OF COMBLESS COLONIES, STIMULATIVE AND GENERAL FEEDING.

The well-informed beekeeper has learned that it is unwise and hazardous to feed under any circumstances honey in any form, even though it be from his own apiary. There have been many sad and general infections with bee diseases by such unguarded feeding. Thus it has become almost an axiom, "Feed no honey." Consequently, substitutes have necessarily been adopted and among these are sugar syrups of various dilutions and compositions; "hard candy," which is virtually a taffy; and recently, the so-called "Fuller candy," which is a soft fondant, not dissimilar to the fondant of chocolate creams.

For several years Mr. Fuller of Blackstone, Mass., as well as others, has been experimenting with this modified English candy, which should not harden beyond usefulness. Beekeepers of Massachusetts and elsewhere about the country have found it advantageous to use this as a substitute for honey or syrup. So numerous are the inquiries and satisfactory the results, that it seems desirable to prepare information in printed form.

The soft candy has numerous advantages and possibilities. It is found to be a most satisfactory stimulative feed; a food for bees in transit, either full colonies on combs, in combless packages, or for queens in mailing cages. It is also found satisfactory and advantageous as winter stores. Colonies have been observed to leave natural stores for the candy. This has occurred in colonies out of doors or in the cellar during winter, as well as with colonies which are flying. Some of the advantages of the candy are the ease with which it is handled or supplied; the fact that it may be made up in quantities and stored until needed for use; its failure to excite robbing; the ability to provision colonies with known amounts or weights; and its freedom from bee disease infection. It is furthermore found to be economical, there being no waste by evaporation or spilling, as is the case with liquid feeds. It is proving exceedingly practical in all feeding purposes and methods.

The candy may be made in any degree of hardness or softness, according to the preference of the individual or the needs of the season. As is inferred above, it may be made and stored for months and even years if properly handled. It may be molded in pulp, or wooden pie-plates, shallow tins or specially constructed feeders (see Figs. 1 and 2), "division-board feeders," overhead or super feeders, or boards may be nailed to the side of a frame and the candy poured and molded within the frame, allowing this to be hung in the hive adjacent to the cluster. With the candy may be mixed pollen substitutes, but these are as yet in the experimental stage, and their efficiency or satisfactoriness is uncertain.

The latest formula or recipe for the cream, or soft candy, fondant, which is practically a confectioner's recipe, is as follows: —

12 pounds granulated sugar.

1½ pounds liquid glucose.[1]

1¼ quarts water (equals 40 ounces, which equals 5 cupfuls).

¼ teaspoonful (about) cream of tartar, added when the temperature reaches about 230° F. or 110° C.

Boil to 238° F. or 114.4° C.

The measurements should be accurate.

A wooden paddle whittled about a foot long, with a 2-inch blade, is found to be superior to a spoon in stirring or beating the candy.

A confectioner's thermometer is an advantage. Those experienced in making maple sugar may dispense with the thermometer, although more accurate results are obtained by using it.

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[1] Granular or crystal glucose may be used, mixing it with the usual amount of water. It may be desirable to modify the amount of glucose.

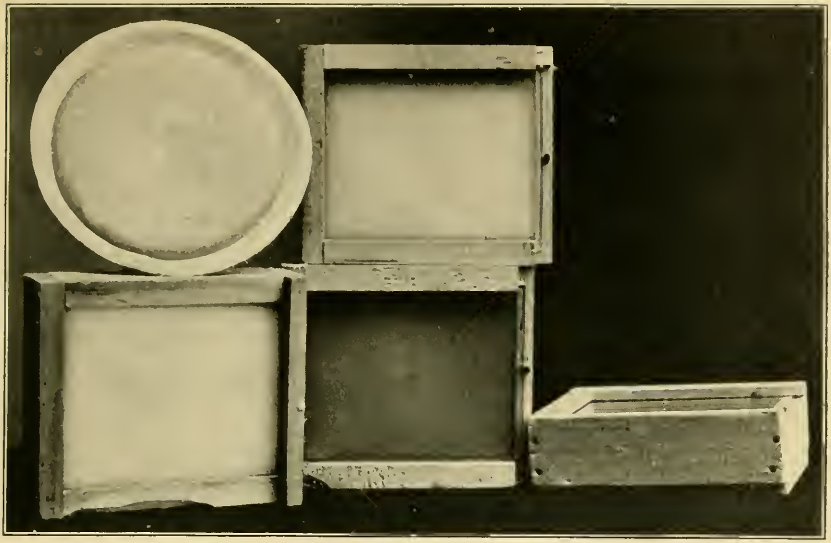

FIG. 1.—These are the usual and convenient types of candy box or feeder. The right-hand one is placed as it would appear on the top of the frames. Notice that one end is slightly elevated. To its left is a box of candy, which is darker, being made with "Coffee A" sugar; the glass side of this faces out, as also in the upper box. The box at the extreme left shows the surface of white candy, made with granulated sugar; it also shows the projection which tilts the box. Upon it is a pie plate filled with the candy, which may be inverted upon the frames. (Author's illustration.)

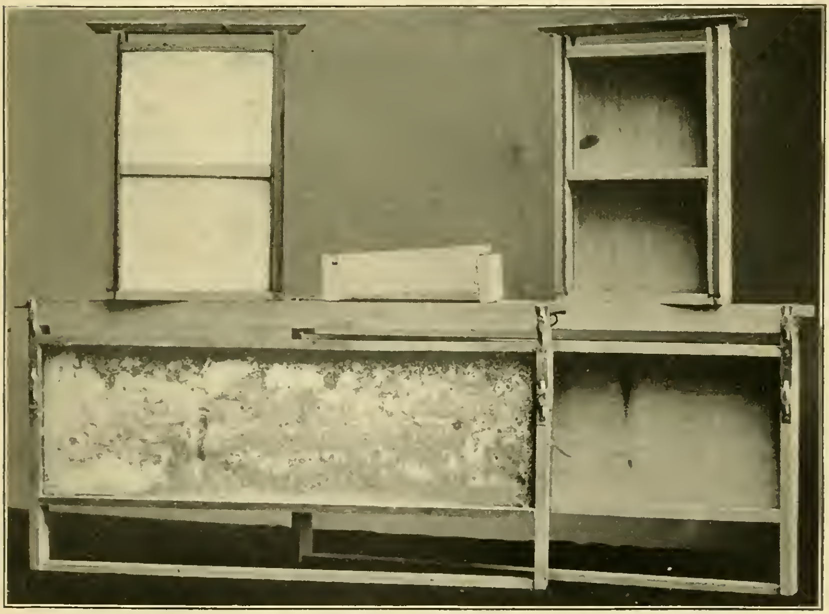

FIG. 2.—Molds in the form of division-board feeders (left-hand mold filled with candy; right hand, empty). The lower frames are the standard Langstroth dimensions; the upper are Benton nuclei frames. The central box shows the position of a feeder on top of the frames. (Author's illustration.)

As soon as the sugar has begun to dissolve, *prior to boiling,* the spoon or paddle used in stirring should be removed from the kettle. *The candy should not be stirred while cooking;* to do it will cause a coarse grain. Remove from the stove and cool to 125°–130° F. (or 51.6°–54.4° C.), when the specified boiling point has been reached. While cooling, in order to equalize the temperature, the mass may be stirred; or preferably, when cooled to the specified degree, it should be stirred until it commences to grain. Mr. Fuller's directions are to stir vigorously until the mass appears in color and consistency like boiled starch or paste. At once pour into molds or feeders and cool.

Fine-grain Fondant for Queen Cages. — Another way to cool the candy is to prepare a marble slab 2 or 3 feet square with bars of square iron, making a form. The candy may be poured upon the marble, and with broad putty knives, similar to those used by paper hangers, the mass may be beaten or worked upon the marble. Experience teaches that this, which is virtually a confectioner's method, produces a finer grain and usually a whiter fondant than when stirred in the kettle. This is the process in preparing candy for use in queen mailing cages, or the transportation of bees. By it, a firmer consistency is usually obtained.

As a warning or explanation it may be said that the higher the temperature at which the candy is boiled the harder it will become; consequently, by varying the boiling point at which the candy is removed from the stove, the hardness or softness of the product may be governed. Furthermore, as is the experience of confection makers, candy should be boiled to one or two degrees higher on cloudy or humid days than on a clear, dry day. By means of a thermometer and a little experience, these features are readily learned.

Storing the Candy. — The fondant is best stored in earthen crocks, either as a mass or in the feeders. These preserve the normal moisture. Over the mass should be placed a sheet of paraffin paper upon which is a moist cloth or towel. The crock should be covered. Queen-cage candy should always be kept in this way in order to preserve its consistency. Similarly, candy molded in feeders may be stored in large crocks or tins.

Remaking the Candy. — If at any time the candy hardens from any cause, either in making, storage or in use, it may be softened by the application of a few drops of water. Furthermore, it may be removed from the molds and recooked to the desired consistency. To recook, add a small amount of water and boil as before.

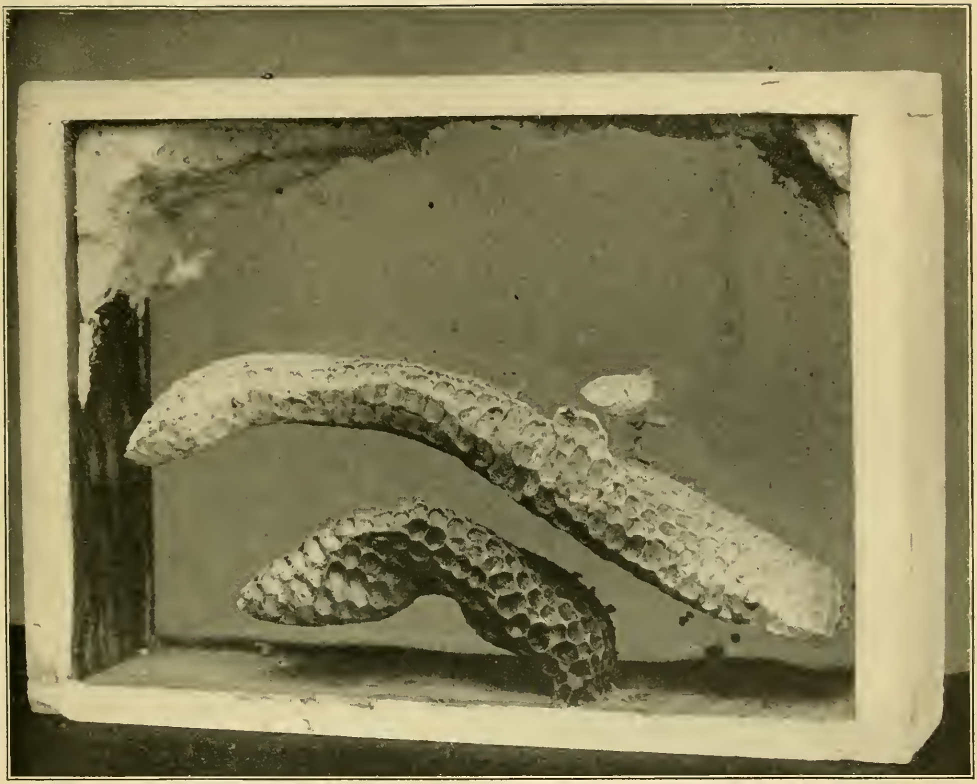

FIG. 3.—When the bees of a strong colony eat up the candy almost entirely, they not infrequently build combs, and have been known even to rear brood, in the box. This shows (upper part of the picture, in corners) the remaining candy upon which the bees were still at work, also having attached combs to the glass. Some beekeepers have removed such a box of combs and brood, starting therefrom a new colony. In order to get the correct relation of the picture, hold it directly above your head. The combs will then appear pendulous from the glass, and in their correct position, as if lifted off from the tops of the frames.

APPENDIX II.

AN INQUIRY INTO THE SPRAYING LAWS OF NORTH AMERICA IN THEIR RELATION TO BEEKEEPING INTERESTS.

The beekeepers of Massachusetts have become agitated over the alleged losses of colonies which have been attributed to spray poison. It has been complained that in certain localities, especially where intensive spraying is the practice, there has been an indiscriminate and possibly injudicious use of sprays. Some have complained, also, of carelessness on the part of spray men, wherein it has been alleged that trees in full bloom — not only the fruit trees but, for instance, the lindens — have been deluged with arsenical poisons. The writer has followed up certain alleged losses and has seen apiaries which were depleted. The devastation was apparently not due to any bee disease which is recognized to-day. Furthermore, the alleged damages from sprays have followed directly the application of spray poisons in the vicinity.

Poisoning from insecticides may affect the colony in two ways. It may immediately kill off the old bees without apparently affecting the brood, or it may deplete the colony of a portion of its field bees so that recovery by fall is usually but partial. Thus there is ultimate damage, wherein the colony fails to recuperate for winter. Furthermore, any depleted colony is seriously handicapped in honey production, and is rendered more susceptible to infectious brood diseases.

As a result of these reports and from the urgency of the situation, a preliminary inquiry has been made into provisions afforded in other States for the protection of bees against insecticidal poisoning. Each State in the Union, as well as the Canadian Provinces and the insular possessions, have been addressed for information concerning the legislation which governs the spraying of trees, especially fruit trees in bloom, or any information or legislation pertaining to spraying in relation to beekeeping. Twenty-eight Provinces, possessions and States have replied. Of these, 23 report that they have no legislation pertaining to spraying so as to protect bees from injury. A few States and Provinces, however, have laws. Those reporting are as follows: —

The Province of Ontario enacted in 1892 a clause prohibiting the spraying of fruit bloom. A quotation from their law is as follows: "No person in spraying or sprinkling fruit trees during the period within which such trees are in full bloom shall use or cause to be used any mixture containing Paris green or any other poisonous substance injurious to bees."

Colorado also in its bee inspection law has a clause (section 11): "It shall be unlawful to spray fruit trees while in bloom with any poisonous spray which is injurious to bees in their egg, larval or adult stages."

A very significant paragraph is contained in a letter of Mr. C. K. Macey, State Horticultural Inspector of Idaho. He says, under date of Sept. 22, 1913: "So far as we have information, I would say that there has been practically no loss of bees in this State from spraying, and if there is such a loss in your State it is probably due to the fact that spraying is done soon after the blossoms open. Our spraying is not done until they have reached the stage where the petals are falling and the bees have about ceased to work on them, except in an occasional instance where a few trees in an orchard bloom unusually late."

Michigan, in 1905 (section 12), ". . . Provided also that no such spraying shall be done while said fruit trees or vines are in blossom, except in case of canker worm."

New York State has a provision (No. 1757): "*Spraying Fruit Trees with Poison.* — Any person who shall spray with, or apply in any way, poison or any poisonous substance to fruit trees while same are in blossom, is guilty of a misdemeanor, punishable by a fine of not less than ten dollars nor more than fifty dollars for each offence; *provided, however,* that nothing in this section" shall interfere with the experimental work at the Ithaca and Geneva stations.

Vermont (in section 5841) provides: "*Spraying Fruit Trees.* — A person who sprays fruit trees when in blossom with a solution containing less than three pounds of unslacked lime to fifty gallons of the solution shall be fined not more than forty dollars nor less than ten dollars."

Besides the above enumeration there are two States which have attempted legislation. These are Connecticut and Wisconsin.

With respect to the conditions in Connecticut, it has been reported that a bill was presented in the last session of the Legislature, but the committee's report was unfavorable. At present, however, there is no legislation on the Connecticut statute book. It was also stated that most farmers understand that it is not necessary to spray until the blossoms have fallen, when of course the danger of killing the bees is past. A few instances of earlier spraying, however, have been reported, and some bees were killed.

Concerning Wisconsin, it is learned that in February, 1911, a bill was introduced in the assembly, but its wording would have utterly prohibited the spraying of fruit trees at any time after the first year in which they blossomed. This bill of course could not pass.

From the numerous communications in regard to this inquiry which were received, many being from State entomologists, there is a general feeling that the education of the horticulturist is of first importance. It is recognized that to spray while a fruit tree is in bloom is undesirable for several reasons. Spraying for the codling moth at this time is unnecessary because the eggs have rarely been laid and the larvæ are usually unhatched. A later spray, when at least two-thirds of the petals have fallen, will be quite as efficient. Furthermore, it is being more and more recognized that to spray the open blossom is likely to injure the sexual organs of the flower and result in preventing the set of fruit. There is almost a country-wide consensus that judicious spraying may effectually be done after at least two-thirds of the petals have fallen; then there will be little danger of injuring bees. The entomologists particularly urge the dissemination of such information.

So far as the reports have been received, this is the status of the spraying problem *versus* beekeeping. It is presented as a preliminary report for future guidance.

TWENTY-THIRD ANNUAL REPORT

OF THE

DAIRY BUREAU

OF THE

MASSACHUSETTS BOARD OF AGRICULTURE,

REQUIRED UNDER

CHAPTER 89, SECTION 12, REVISED LAWS.

PRESENTED TO THE BOARD AND ACCEPTED,
JANUARY 15, 1914.

DAIRY BUREAU—1913.

CHARLES M. GARDNER, WESTFIELD, *Chairman.*
GEORGE W. TRULL, TEWKSBURY, P. O. LOWELL, R. F. D.
OMER E. BRADWAY, MONSON, MASS.

Secretary.

J. LEWIS ELLSWORTH, *Executive Officer and Secretary of the State Board of Agriculture to May 1, 1913.*
WILFRID WHEELER, *Executive Officer and Secretary of the State Board of Agriculture from May 1, 1913.*

General Agent.

P. M. HARWOOD.

ADDRESS, ROOM 136, STATE HOUSE, BOSTON.

REPORT OF THE DAIRY BUREAU.

The work of the Bureau for the year 1913 has been augmented by additional duties attendant upon the carrying out of the resolve of the Legislature for the encouragement of practical dairying. By vote of the Board of Agriculture this work was given over to its Dairy Bureau. The resolve reads as follows: —

Chapter 96, Acts of 1913.

Resolve to provide for the Encouragement of Dairying and the Production of Milk and Dairy Products of Superior Quality.

Resolved, That the state board of agriculture is hereby authorized to provide for the encouragement of practical dairymen in the production of milk and dairy products of superior quality and cleanliness, by offering prizes for the best kept stables, the lowest bacteria counts and best quality of milk, or otherwise, as the board may determine; by demonstrations illustrating the best methods of dairying; by agents who shall instruct the citizens of the commonwealth in matters of stable construction and management and dairy methods in general; by the distribution of literature giving information in regard to the best methods of dairying and especially in regard to the production of clean milk; or in such other manner as the board may deem best for the encouragement of dairying and the production of clean milk. For travelling, incidental, administrative and office expenses necessarily incurred in carrying out the purposes of this resolve the said board may expend a sum not exceeding five thousand dollars annually for three years, beginning with the year nineteen hundred and thirteen, and if any part of the said five thousand dollars remains unexpended at the close of any one year, the balance may be expended in the following year. [*Approved May 26, 1913.*

This work — encouragement of practical dairying — opens up a field of great interest. During recent years, in milk-shipping sections of the State, many farmers have either curtailed their business, given up milk production,[1] sold their farms or changed their system of farming. The farms when sold have usually gone into the hands of city people for country homes or for so-called fancy farming. Poles and other immigrants have not purchased dairy farms to any extent, preferring the onion and tobacco farms of the Connecticut valley or truck farms adjacent to large cities.

We are of the opinion that the great hope for the future of Massachusetts dairying lies in the production of clean, wholesome milk for near-by markets for a price higher than that paid for railroad market milk from northern New York, northern New England and Canada, which cannot be safely sold without pasteurization. Whatever may be done in the way of inspection and supervision in the future, long-hauled milk sold in large cities will continue to be pasteurized, — or treated in some equal or superior manner, — in order that the public health may be safeguarded and the milk contractors and dealers protected. We believe that inspection of dairies, while necessary and important, is frequently overestimated in the public mind, and that the real good that comes from these inspections is the simple removal of unsound animals and of unsanitary conditions without frills, fads and unnecessary requirements. Dairy inspection is not a guarantee of cleanliness. The best way in which clean milk can be secured from dairies three hundred and sixty-five days in the year is to pay for it on the basis of cleanliness and freedom from contamination.

With the limited sum of $5,000 per annum at our disposal, we cannot do all that we would like. In fact, we can only make a beginning in a few ways. We believe that by encouragement and incidental instruction, habits of dairymen, however good, can be improved. In carrying out this idea we have during the year offered prizes aggregating $3,000, $2,550 of which was for clean milk, and $450 for the protection of dairies from flies. For convenience, the State was divided into two sections, — eastern and western. In the eastern section there were 37 entries. These dairies were examined in the month of September. Answers to pertinent questions were obtained, photographs of premises taken, and samples of milk run through absorbent cotton, and the cottons examined later for sediment. The prizes were awarded September 30 and were made public at the Brockton Fair. In the western section there were 114 entries. These dairies were examined in the month of October and the prizes awarded later. The names of the winners were announced at the State Board of Agriculture meeting at Springfield, December 1. In the contest for dairies best protected from flies there were 18 entries. These dairies were examined early in October, and the announcement of the prizes was made at the Springfield meeting. So far as we know, these were the first prizes ever offered along these lines, but the results have exceeded our most sanguine expectations. The successful contestants have cheerfully signed the following expression of determination: —

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[1] In 1890 there were assessed in Massachusetts 200,658 cows; in 1906, 181,816; in 1912, 161,608; and in 1913, 151,276. This shows a decrease, from 1890 to 1913, of 49,382; from 1906 to 1913, of 30,540; and from 1912 to 1913, of 10,332.

> Consideration of the generosity of the Commonwealth in offering liberal prizes for the production of clean milk, together with my own interest in the matter, leads me to express my determination to continue the means adopted in this contest, and to add thereto from time to time such improvements as appear practical, to the end that the present high standing of Massachusetts milk may be maintained and its quality improved.

Many contestants have voluntarily stated that they learned more about the production of clean milk in this contest than they ever knew before.

For details in the protection from flies contest, reference is made to Circular No. 10 of the series now being published by the State Board of Agriculture. Further details in regard to the clean milk contest will be found in Circular No. 13 of the same series.

It is hoped that during the coming year even more far-reaching results may be realized from plans already in contemplation.

The Bureau takes this opportunity to express its appreciation and thanks for the services of Prof. Samuel C. Prescott of the Massachusetts Institute of Technology, and Mr. E. H. Forbush of the State Board of Agriculture, as judges who acted without pay in the clean milk and protection from flies contests, respectively; also to milk inspectors S. C. Downs and J. A. Gamble of Springfield, G. L. Berg of Worcester, Fred E. Marsh of Ware, Clifford W. Shippee of Gardner, and others who did much to awaken local interest, besides furnishing valuable assistance in the clean milk contest; also to Mr. Fred F. Walker, Commissioner of Animal Industry, and the inspectors of animals throughout the Commonwealth, for valuable assistance in obtaining information relating to the dairymen in Massachusetts.

The police work of the Board for 1913 has resulted in 149 cases in court and 146 convictions. Seven of these cases were for violation of the milk laws, 54 for the violation of the renovated butter law and 88 for the violation of the oleomargarine laws.

In the educational work, 17 lectures have been given by the general agent. These lectures have explained the food value of milk, advocated its increased consumption and more economical distribution, and that its price be based upon quality and cleanliness. We believe these to be among the basic essentials in bringing to dairymen a more prosperous condition, and to consumers greater security in their milk supply. Most of the creameries, and many dairy plants in the State, have been visited during the year, and special exhibits of the work of the Bureau were made at Brockton and Springfield.

Bulletins on "Dairying in Denmark," edited by P. M. Harwood, "Cost of Milk Production," by Prof. Fred Rasmussen, "What it Costs to produce Milk in New England," by P. M. Harwood, with extracts from special articles by Mr. Elmer D. Howe, Prof. John M. Trueman, Prof. Fred Rasmussen, and Dr. Joseph B. Lindsey, have been published, and statistics relating to milk producers and breeders of pure-bred dairy stock have been gathered.

Early in the year the general agent was appointed by the Governor, together with Dr. Mark W. Richardson of the State Board of Health and Gen. Charles W. Wood of Worcester, to attend a milk conference in New York. This conference voted that the main control of the milk business should remain in the hands of the agricultural departments of the several States represented, and the milk inspection divided between agricultural and health authorities. Later in the year the general agent was appointed by the governor to attend a conference of the United States department and State departments for bringing about more uniform laws and regulations in the control of dairy and food supplies.

Milk Consumption.

It is gratifying to know that the consumption of milk in Greater Boston is gradually increasing from the low ebb reached in 1911. The figures of the Massachusetts Board of Railroad Commissioners show the receipts of railroad milk to be 107,306,849 quarts. (See table on page 300.)

Condensed Milk.

The Chamber of Commerce gives receipts of condensed milk, including evaporated cream in Boston for 1913, as 3,484 barrels and 321,883 cases, as against 2,304 barrels and 321,946 cases in 1912. This indicates but slight increase in the consumption of these products during the year. (See table on page 300.)

Milk Inspectors.

The number of milk inspectors in the State has been increased during the year, and their high reputation for efficiency maintained. Our thanks are due to many for their kindly co-operation and assistance at all times. A list of these inspectors will be found on pages 305–307.

Oleomargarine.

The number of retail oleomargarine licenses in force in the State November, 1912, was 846, while in 1913 it was 884, showing an increase of 38 oleomargarine licenses in Boston. As reported by the Chamber of Commerce in 1912, it was 140,040 packages, while in 1913 it was 127,994, showing a decrease of 12,046. Oleomargarine produced in the

United States in 1912 was 128,601,053 pounds, while in 1913 it was 145,227,872, showing an increase of 16,626,829. This increase in the manufacture of oleomargarine, and its apparent increased consumption in the United States, is undoubtedly due to the high cost of living, but the decrease in number of packages of oleomargarine wholesaled in Boston, together with the but slight increase in number of Massachusetts licenses, indicates that the majority of people in this State still prefer to use genuine butter. (For further details, see tables on page 297.)

Renovated Butter.

In 1912 there were 46,387,398 pounds of renovated butter produced in the United States, while in 1913 there were 38,354,762, showing a decrease of 8,032,636 pounds in twelve months, which indicates a decline of these goods in public favor. (See table on page 298.)

Butter.

The annual statement of the Boston Chamber of Commerce shows an increase in the consumption of butter, Boston output, during 1913 of 1,312,224 pounds, which is a fairly normal increase. The average wholesale price of 31.7 cents for the year, against 31.2 cents for 1912, has had no apparent effect upon the butter consumption. (Details will be found on pages 298 and 299.)

Personnel of the Bureau.

The personnel of the Bureau is as follows: Charles M. Gardner of Westfield, chairman, George W. Trull of Tewksbury and Omer E. Bradway of Monson. The executive force, agents and analysts, etc., are as follows: executive officer and secretary, Wilfrid Wheeler;[1] general agent, P. M. Harwood; analysts, B. F. Davenport, M.D., Boston, and F. W. Farrell, Emerson Laboratory, Springfield; agent, A. W. Lombard; and five others have been temporarily employed.

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[1] Since May 1, 1913.

SUMMARY OF POLICE WORK.

Total number of inspections,	[1]8,161
Number of inspections where no samples were taken,	4,609
Number of samples of butter, oleomargarine and condensed milk, all purchased,	3,458
Number of samples of milk and cream,	94
Cases entered in court,	149
Addresses by general agent and others,	18

Cases prosecuted during the twelve months ending Nov. 30, 1913, by months and courts, with law violated, and results, are as follows: —

COURT.	Month.	Number.	Law violated.	Convicted.	Discharged.
Lynn Police,	December,	4	4 renovated butter,	4	-
Malden, First Eastern Middlesex District.	December,	2	2 oleomargarine,	2	-
Gloucester, Eastern Essex District.	December,	2	2 oleomargarine,	2	-
Worcester, Central District,	December,	4	4 oleomargarine,	4	-
New Bedford, Third Bristol District.	January,	38	18 renovated butter, 20 oleomargarine.	34	4
Holyoke Police,	January,	3	3 oleomargarine,	3	-
Lawrence Police,	February,	16	6 renovated butter, 10 oleomargarine.	16	-
East Brookfield, Western Worcester District.	March,	2	2 renovated butter,	2	-
Salem, First Essex District,	March,	2	2 oleomargarine,	2	-
Lynn Police,	March,	6	2 renovated butter, 4 oleomargarine.	6	-
Worcester, Central District,	March,	7	1 renovated butter, 6 oleomargarine.	7	-
Webster, First Southern Worcester District.	March,	4	4 renovated butter,	4	-
Boston Municipal,	April,	2	2 oleomargarine,	2	-
Haverhill, Northern Essex District.	April,	16	8 renovated butter, 8 oleomargarine.	16	-
Athol, First Northern Worcester District.	April,	4	4 oleomargarine,	4	-
Gardner, First Northern Worcester District.	April,	7	3 renovated butter, 4 oleomargarine.	7	-
Boston Municipal, Charlestown District.	April,	1	1 oleomargarine,	1	-
Springfield Police,	April,	3	3 oleomargarine,	3	-
Boston Municipal, Brighton District.	May,	2	2 renovated butter,	2	-
Lowell Police,	May,	7	7 oleomargarine,	7	-
Salem, First Essex District,	May,	2	2 renovated butter,	2	-
Worcester, Central District,	May,	2	2 cream,	2	-
Worcester, Central District,	June,	1	1 cream,	1	-

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[1] There were 79 extra samples taken during the year, therefore this number is less than the sum of the next three items.

COURT.	Month.	Number.	Law violated.	Convicted.	Discharged.
Haverhill, Northern Essex District.	July, . .	2	2 cream, . .	2	-
Lawrence Police, . .	November, .	4	2 milk, 2 oleomargarine.	4	-
Quincy, East Norfolk District.	November, .	2	2 renovated butter,	2	-
Chelsea Police, . . .	November, .	2	2 oleomargarine, .	2	-

NOTE. — The Bureau is indebted to the milk inspectors of Massachusetts for assistance which has resulted in court cases.

The charges in the several cases entered in court for the year ending Nov. 30, 1913, have been as follows: —

Selling renovated butter in unmarked packages, ...	54
Selling oleomargarine without being registered, ...	3
Selling oleomargarine in unmarked[1] packages, ...	11
Furnishing oleomargarine in restaurants, etc., without notice to guests, ...	73
Selling milk below standard, ...	2
Selling cream below standard, ...	5
Selling oleomargarine without sign in store, ...	1
	149

The following table shows the inspections without samples, and the number of samples taken during the past eleven years: —

YEARS.	Inspections without Samples.	Samples.
1903-12 (inclusive), ...	51,682	14,575
1913, ...	4,609	3,552
Total for eleven years, ...	56,291	18,127
Average, ...	5,117	1,647

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[1] In these cases oleomargarine was sold when butter was asked for, but the charge was made in this way for convenience.

Tables relating to Oleomargarine.

The number of United States oleomargarine licenses in force in Massachusetts in November, 1912 and 1913, is as follows: —

	1912.	1913.
Wholesale licenses in Boston, ...	18	19
Wholesale licenses in other cities, ...	9	12
Totals, ...	27	31
Retail licenses in Boston, ...	124	121
Retail licenses in other cities and towns, ...	722	763
Totals, ...	846	884

The following figures, taken from the annual report of the United States Commissioner of Internal Revenue for 1913, show the production, withdrawn tax paid, and withdrawn for export of the two classes of oleomargarine, as defined by act of May 9, 1902, covering the period of eleven years, since it went into effect on July 1, 1902: —

Oleomargarine (Pounds).

Year.	Product taxed at Rate of 10 Cents per Pound.			Product taxed at Rate of ¼ Cent per Pound.		
	Produced.	Withdrawn Tax paid.	Withdrawn for Export.	Produced.	Withdrawn Tax paid.	Withdrawn for Export.
1903, . . .	5,710,407	2,312,493	3,334,969	67,573,689	66,785,796	151,693
1904, . . .	3,785,670	1,297,068	2,504,940	46,413,972	46,397,984	123,425
1905, . . .	5,560,304	3,121,640	2,405,763	46,427,032	46,223,691	137,670
1906, . . .	4,888,986	2,503,095	2,422,320	50,545,914	50,536,466	78,750
1907, . . .	7,758,529	5,009,094	2,695,276	63,608,246	63,303,016	129,350
1908, . . .	7,452,800	4,982,029	2,522,188	74,072,800	73,916,869	109,480
1909, . . .	5,710,301	3,275,968	2,403,742	86,572,514	86,221,310	112,958
1910, . . .	6,176,991	3,416,286	2,767,195	135,685,289	135,159,429	97,575
1911, . . .	5,830,995	2,764,971	3,054,344	115,331,800	115,448,006	91,750
1912, . . .	6,235,639	3,174,331	3,044,122	122,365,414	121,945,038	106,160
1913, . . .	6,520,436	4,090,658	2,417,973	138,707,426	138,242,848	59,686
Totals, .	65,631,058	35,947,633	29,572,832	947,304,096	944,180,453	1,198,497

RENOVATED BUTTER.

The following figures, from the same source as the preceding table, show the production and withdrawn tax paid of renovated butter, 1902–13: —

Renovated Butter (Pounds).

YEAR.	Production.	Withdrawn Tax paid.
1903,	54,658,790	54,223,234
1904,	54,171,183	54,204,478
1905,	60,029,421	60,171,504
1906,	53,549,900	53,361,088
1907,	62,965,613	63,078,504
1908,	50,479,489	50,411,446
1909,	47,345,361	47,402,382
1910,	47,433,575	47,378,446
1911,	39,292,591	39,352,445
1912,	46,387,398	46,413,895
1913,	38,354,762	38,285,114
Totals,	554,668,083	554,282,536

BUTTER.

The following table shows the average quotation for the best fresh creamery butter, in a strictly wholesale way, in the Boston market for the last ten years, as compiled by the Boston Chamber of Commerce: —

MONTH.	1913.	1912.	1911.	1910.	1909.	1908.	1907.	1906.	1905.	1904.
	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.
January,	33.9	36.9	28.8	33.5	30.9	29.7	30.4	25.2	28.0	22.7
February,	34.9	32.5	26.9	30.5	30.0	32.1	31.7	25.2	31.6	24.6
March,	36.4	32.1	24.2	32.0	29.1	30.2	30.2	25.5	28.0	24.1
April,	34.5	32.7	21.7	31.5	27.9	28.4	32.2	22.2	29.1	21.6
May,	28.7	30.4	22.8	29.0	26.6	24.1	31.4	19.9	23.9	19.9
June,	28.2	27.9	24.2	28.2	26.4	24.5	24.3	20.2	20.7	18.4

Month.	1913. Cents.	1912. Cents.	1911. Cents.	1910. Cents.	1909. Cents.	1908. Cents.	1907. Cents.	1906. Cents.	1905. Cents.	1904. Cents.
July,	27.5	28.1	26.0	28.6	27.2	23.6	25.9	21.0	20.6	18.3
August,	28.2	27.1	27.2	29.6	28.2	24.5	26.0	23.8	21.6	19.1
September,	31.3	29.1	27.7	29.6	31.3	25.3	29.2	25.6	21.2	20.8
October,	31.2	31.0	30.4	29.4	31.7	27.5	29.9	26.9	22.1	21.5
November,	31.9	32.9	32.5	30.2	31.4	29.5	27.1	27.6	23.0	24.1
December,	33.8	34.0	35.0	30.0	32.9	31.0	27.5	30.7	23.9	25.7
Averages,	31.7	31.2	27.3	30.2	29.5	27.5	28.8	24.48	24.47	21.73

The Chamber of Commerce figures regarding the butter business in Boston for 1912 and 1913 are as follows: —

	1913. Pounds.	1912. Pounds.
Carried over in storage,	8,340,102	6,612,966
Receipts for January,	2,314,428	3,282,660
February,	2,870,790	3,256,729
March,	3,365,435	3,565,555
April,	4,433,969	3,905,002
May,	8,659,092	7,003,321
June,	12,938,572	12,225,290
July,	12,323,011	13,030,718
August,	8,333,419	8,346,787
September,	6,096,706	6,051,810
October,	4,241,941	4,961,020
November,	2,876,134	3,717,156
December,	3,251,088	2,263,182
Total supply,	80,044,687	78,222,196
Exports for year, deduct,	200	24,005
Net supply,	80,044,487	78,198,181
Storage stock December 27, deduct,	8,874,204	8,340,102
Consumption for year,	71,170,283	69,858,059

RECEIPTS OF CONDENSED MILK.

The Chamber of Commerce figures regarding the receipts of condensed milk at Boston for 1912 and 1913 are as follows: —

	1913. Barrels.	1913. Cases.[1]	1912. Barrels.	1912. Cases.[1]
January,	147	19,621	318	34,212
February,	167	24,862	174	32,066
March,	260	30,670	193	16,247
April,	170	22,193	375	20,614
May,	96	21,946	107	23,578
June,	320	38,300	187	27,080
July,	269	39,502	217	37,387
August,	137	22,902	146	44,461
September,	254	28,693	76	14,838
October,	1,328	25,895	262	22,240
November,	130	17,694	27	27,144
December,	206	29,605	222	22,079
Totals,	3,484	321,883	2,304	321,946

[1] Includes evaporated cream.

MILK.

Milk brought into Boston by Different Railroads, Dec. 1, 1912, to Nov. 30, 1913, as reported by the Railroad Commissioners (Quarts).

DATE.	Boston & Albany.	Boston & Maine.	New York, New Haven & Hartford.	Total.
1912.				
December,	651,882	6,916,685	1,422,419	8,990,986
1913.				
January,	429,311	7,179,151	1,437,881	9,046,343
February,	380,481	6,693,732	1,439,468	8,513,681
March,	444,513	7,377,392	1,546,405	9,368,310
April,	442,251	7,438,618	1,475,735	9,356,604
May,	500,943	7,732,448	1,748,368	9,981,759
June,	465,740	7,520,704	1,662,461	9,648,905
July,	451,915	7,430,444	1,725,201	9,607,560
August,	436,862	6,820,345	1,612,586	8,869,793
September,	490,677	6,151,288	1,550,894	8,192,859
October,	550,381	5,913,873	1,594,625	8,058,879
November,	586,978	5,578,902	1,505,290	7,671,170
Totals,	5,831,934	82,753,582	18,721,333	107,306,849

Comparative List of Number of Cows assessed in Massachusetts, May 1, 1906, April 1, 1912, and May 1, 1913.

COUNTIES.	1906.	1912.	1913.	DECREASE.		INCREASE.	
				1906-13.	1912-13.	1906-13.	1912-13.
Barnstable, . . .	2,448	2,305	2,251	197	54	-	-
Berkshire, . . .	17,404	16,463	15,317	2,087	1,146	-	-
Bristol, ...	13,702	13,552	12,803	899	749	-	-
Dukes, ...	656	583	588	68	-	-	5
Essex, ...	17,131	14,529	13,456	3,675	1,073	-	-
Franklin, . . .	12,715	11,941	10,986	1,729	955	-	-
Hampden, . . .	12,096	10,504	9,486	2,610	1,018	-	-
Hampshire, . . .	14,383	12,261	11,467	2,916	794	-	-
Middlesex, . . .	29,508	25,932	24,060	5,448	1,018	-	-
Nantucket, . . .	378	419	453	-	-	75	34
Norfolk, . . .	11,200	10,095	9,766	1,434	329	-	-
Plymouth, . . .	8,465	7,765	7,613	852	152	-	-
Suffolk, . . .	1,186	1,015	1,138	48	-	-	123
Worcester, . . .	40,544	34,244	31,892	8,652	2,352	-	-
Totals, . . .	181,816	161,608	151,276	30,615	10,494	75	162

List of Massachusetts Farms making Milk of Superior Quality and Cleanliness and selling their Product higher than the Regular Market Price.

LOCATION, FARM.	Owner and Manager.	Approximate Number of Cows.	Where marketed.
Agawam, Reilly Farm, . .	J. J. Reilly, owner and manager.	17	Springfield.[1]
Agawam, Colonial Farm, . .	H. E. Bodurtha, owner and manager.	12	Springfield.
Agawam, Elm Shade Dairy, .	S. S. & E. F. Bodurtha, owners and managers.	25	Springfield.
Amherst, ...	H. M. Thompson, owner and manager.	25	Holyoke.
Amherst, Groff & Simmons' farm.	Groff & Simmons, owners and managers.	34	Amherst.
Andover, Arden Farm, . .	Wm. M. Wood, owner, J. M. Putnam, superintendent, Austin C. Huggins, manager of creamery.	55[2]	Andover, Lawrence, Woburn and Boston.
Andover, Shattuck Farms, .	F. Shattuck, owner and manager.	50	Lawrence.

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[1] Several out-of-State farms also furnish milk of this class in Springfield.

[2] Twenty-five cows in Andover and 30 in New Hampshire.

List of Massachusetts Farms making Milk of Superior Quality and Cleanliness and selling their Product higher than the Regular Market Price — Continued.

Location, Farm.	Owner and Manager.	Approximate Number of Cows.	Where marketed.
Auburn, Wellswood Farm, .	Geo. O. Keep, owner and manager.	30	Worcester.
Barnstable, Bay Farm, . .	H. C. Everett, owner and manager.	-	Barnstable.
Barre, Highland View Farm, .	D. A. Howe, owner, W. E. Howe, manager.	25	Worcester.
Bolton, Rocky Dundee Farm, .	R. H. Randall, lessee and manager.	20	Clinton.
Boston, Walker-Gordon Farm, 1106 Boylston Street.	Walker-Gordon Laboratory Company, owner, John Nichols, manager.	100	Boston and vicinity.
Brimfield, Clarence B. Brown's Farm.	Clarence B. Brown, owner and manager.	22	West Warren.
Brockton, Montello Station, Dutchland Farm.	Fred F. Field, owner, Earl D. Upton, manager.	70	Brockton.
Chilmark, West Tisbury, P. O. Oakview Farm.	J. F. Adams, owner, .	17	Vineyard Haven and Edgartown.
Dighton, Rock Farm, . . .	J. W. Earle, owner, Ralph Earle, manager.	15	Fall River.[1]
Dorchester, Codman Farm, .	Watson B. Fearing, owner and manager.	58	Boston.
East Lynn, ...	J. D. Coombs, lessee and manager.	3	East Lynn.
Fairhaven, Dana Farm, . .	Eliza N. and Edith Dana, owners and managers.	52	Fairhaven, Marion and Mattapoisett (in summer).
Framingham, Millwood Farm, .	Mrs. E. F. Bowditch, owner, J. P. Bowditch, manager, F. E. Barrett, superintendent.	178	Boston and Wellesley.
Framingham, Waverney Farm, .	Reginald W. Bird, owner, A. E. White, manager.	50	Boston.
Franklin, Ray Farm, . .	E. K. Ray, estate owner, Joseph G. Ray, trustee and manager.	100	Boston, by Elm Farm Company.
Gloucester, Howard P. Lane's farm.	Howard P. Lane, owner and manager.	50	Gloucester.
Gloucester, H. Wallace Lane's farm.	H. Wallace Lane, owner and manager.	30	Gloucester.
Gloucester, Peter Hadstrom's farm.	Peter Hadstrom, owner and manager.	5	Gloucester.
Granby, C. W. Ball's farm, .	C. W. Ball, owner and manager.	29	Holyoke.
Greenfield, Wayside Farm, .	Frank H. Reed, owner, Mr. Purrington, manager.	25	Greenfield.
Hamilton, Miles River Farm, .	Maxwell Norman, owner and manager, C. E. Johnson, superintendent.	140	Boston.
Hardwick, Mixter Farm, . .	Mary A. Mixter, owner, Dr. Samuel J. Mixter, manager, S. R. Parker, superintendent.	165	Boston.
Haverhill (Bradford District), J. B. Sawyer's farm.	J. B. Sawyer, owner and manager.	-	Haverhill.
Haverhill (Bradford District), Cedar Crest Farm.	C. Herbert Poor, owner and manager.	20	Haverhill.[2]
Haverhill, North Broadway Milk Farm.	E. A. Emerson, owner and manager.	35	Haverhill.
Haverhill (P. O. East Haverhill), Fred Kimball's Farm.	Fred Kimball, owner, Leonard Kimball, manager.	35	Haverhill.

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[1] Several Rhode Island farms also furnish milk of this class in Fall River.

[2] Two New Hampshire dairymen, Geo. B. Freeman and Herbert N. Sawyer, also sell milk of this class in Haverhill.

List of Massachusetts Farms making Milk of Superior Quality and Cleanliness and selling their Product higher than the Regular Market Price — Continued.

Location, Farm.	Owner and Manager.	Approximate Number of Cows.	Where marketed.
Holyoke, Whiting Farm,	W. F. Whiting, owner, John F. Richardson, manager.	20	Holyoke.
Kingston, Miss Helen Holmes' Farm.	Miss Helen Holmes, owner and manager.	20	Kingston.
Lee, John Goodrich's Farm,	John Goodrich, owner and manager.	40	Lee.
Longmeadow, Hillbrow Farm,	H. M. Burt, owner and manager.	20	Springfield.
Lowell, Hood Farm,	C. I. Hood, owner, J. E. Dodge, manager.	120	Lowell.
Ludlow, E. E. Chapman's Farm,	Edward E. Chapman, owner and manager.	22	Ludlow and Indian Orchard.
Lunenburg, Sunnyside Farm,	Geo. M. Proctor, owner, Fred A. Miller, manager.	48	Fitchburg.
Marlborough, Fairview Farm,	Elmer D. Howe & Son, owners and managers.	10	Marlborough.
Medford, Mystic Valley Farm, 75 Arlington Street.	John J. Mulkevin, owner and manager.	16	Medford.
Medford, Hillside Farm, 20 Gow Street.	Alberton Harris, owner and manager.	10	Medford.
Methuen, Bragdon Farms,	E. L. Bragdon, owner and manager.	30	Lawrence.
Methuen, Cox Farms,	Louis Cox, owner, L. Coburn, manager.	31	Lawrence.
Methuen, Howe Farm,	E. D. Taylor, owner and manager.	50	Lawrence.
Methuen, Spring Valley Farms,	Fred Miller, owner and manager.	50	Lawrence.
Methuen, S. W. Williams' farm,	S. W. Williams, owner and manager.	30	Lawrence.
Millis, Lowland Farm,	E. F. Richardson, owner and manager.	25	Boston.
Milton, Highland Farm,	Patriquin & Newton, lessees, George Patriquin, manager.	65	Milton.
Needham, K. E. Webb's Farm,	Keneth C. Webb, owner and manager.	31	Needham.
Newton, Waban Post Office, W. B. McMullin's Farm.	Wm. B. McMullin, owner and manager.	17	Needham and Newton.
Norfolk, Meadowside Farm,	T. D. Cook & Co., owners and managers.	35	Boston.
North Amherst, The Elms,	R. D. Dickinson, owner and manager.	30	Amherst.
North Falmouth, Manuel G. White's Farm.	Manuel G. White, owner and manager.	6	North Falmouth.
North Grafton, Bonnybrook Farm.	Everett N. Kearney, owner and manager.	73	Worcester.
Northampton, W. J. LaFleur's farm.	W. J. LaFleur, owner and manager.	11	Northampton.
Oak Bluffs, Woodsedge Farm,	F. W. Chase, owner and manager.	20	Oak Bluffs.
Paxton, E. G. Richard's farm,	E. G. Richards, owner and manager.	40	Worcester, by C. Brigham & Co.
Paxton, Echo Farm,	W. J. Woods, owner, Joseph Graham, manager.	40	Worcester, by C. Brigham & Co.
Peabody, Maplehill Farm,	- -	-	Boston, by H. P. Hood & Sons.[1]
Pittsfield, E. W. Page's farm,	E. W. Page, owner and manager.	8	Pittsfield.
Pittsfield, Mr. Bardwell's farm,	Mr. Bardwell, owner and manager.	14	Pittsfield.
Pittsfield, Abby Lodge,	A. W. Cooley, owner, Mr. Carlson, manager.	35	Boston.
Saugus, Oaklandvale Farm,	Frank P. Bennett, owner and manager.	112	Lynn.

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[1] H. P. Hood & Sons also distribute this class of milk from 10 farms in New Hampshire.

List of Massachusetts Farms making Milk of Superior Quality and Cleanliness and selling their Product higher than the Regular Market Price — Concluded.

LOCATION, FARM.	Owner and Manager.	Approximate Number of Cows.	Where marketed.
South Lincoln, South Lincoln Dairy Company.	South Lincoln Dairy Company, owners, W. A. Blodgett, manager.	250	Boston, Cambridge and Brookline.
South Natick, Carver Hill Farm.	Carver Hill Farms Inc., Austin Potter.	75	Boston, Wellesley, Natick, Needham and Dover.
Sherborn, ...	H. N. Brown, owner and manager.	50	Boston.
Sherborn, ...	J. M. Merriam, owner and manager.	40	Boston.
Sterling, Twin Oaks Farm (P. O. Pratt's Junction).	Rodney Monk, owner and manager.	75	Milk, Boston; cream, Worcester.
Stoughton, Tobey Farm, . .	E. B. Hutchins, owner and manager.	15	Brockton.
Taunton, Geo. Soper's farm, .	George Soper, owner and manager.	30	Taunton.
Westwood, Fox Hill Farm, .	Joshua Crane, owner, L. W. Jackman, manager.	100	Boston.
West Newton and Barre, Wauwinet Farm.	Geo. H. Ellis, owner, P. F. Staples and R. M. Hardy, managers.	400	Boston, Brookline and Newton.
Warren, Maple Farm, . .	J. R. Blair, owner, R. A. Siddens, manager.	27	Boston, by C. Brigham Company.
Worcester, Pleasant View Farm,	Warren C. Jewett, owner and manager.	40	Worcester.
Worcester, ...	Lewis J. Kendall, owner and manager.	40	Worcester.
Worcester, Intervale Farm, .	J. Lewis Ellsworth, owner and manager.	14	Worcester.
Worcester, Village Farm, . .	H. B. Prentice, owner and manager.	30	Worcester.

NOTE. — Deerfoot Farm Dairy, office 9 Bosworth Place, Boston, with milk depots at both Southborough and Northborough, sells milk of superior quality and cleanliness at a price above that of ordinary market milk, and handles the product of 129 dairy farms, averaging about 10 cows each, located in Southborough, Northborough, Westborough and Holliston. Most of these farms, therefore, at some time during the year come properly within the requirements of this list. The method of payment of this milk is explained in the following extract from a letter from the proprietor, Mr. Robert M. Burnett: "The milk from all our farms is tested once or twice a week on delivery at the dairy, samples being taken by Professor Prescott's agent. When the milk is found to contain below 25,000 bacteria per cubic centimeter, and cows, feed, water and stable conditions are reported by Dr. J. W. Robinson as healthful and satisfactory, and the average test is not lower than 4½ per cent butter fat, the price paid is 50 cents per can at the Deerfoot Dairy for the full yield all the year around. For any milk passing the above conditions, of good quality, testing below 4½ per cent butter fat, we pay 45 cents per can for such proportion as we can bottle. For the balance of the milk not bottled, and for the milk from farms not meeting the conditions required for bottled milk, we pay the price agreed upon between the Milk Producers Association and the Contractors Union. For the month of December, 1912, this compact was with 129 farms averaging about 10 cows to the farm."

The foregoing list is necessarily incomplete and subject to continual change. Additional names, eligible to this list, are earnestly solicited.

List of Massachusetts Dairy Farms making Certified Milk.

NAME, LOCATION.	Owner and Manager.	Approximate Number of Cows.	Certified by —	Where marketed.
Cedar Hill Farm, Waltham.	Miss Cornelia Warren, owner, Chas. Cahill, manager.	215	Cambridge Medical Commission.	Waltham, Cambridge, Boston.
Cedar Crest Farm, Waltham.	John C. Runkle, owner, Louis W. Dean, manager.	90	Cambridge Medical Commission.	North Shore, Cambridge, Boston.
Cherry Hill Farm, Beverly.	H. P. Hood & Sons, owners, O. H. Perrin, manager.	80	Medical Milk Commission of Boston.	Boston, North Shore, Lawrence.
A. D. Davis, farm, Sheffield.	A. D. Davis, owner and manager.	60	- -	A little in Great Barrington. Mostly outside of State.
Ledyard Farm, Andover.	J. A. & W. H. Gould,	50	Malden Medical Commission.	Malden.
Massachusetts Agricultural College Farm, Amherst.	Massachusetts Agricultural College Farm, J. A. Foord.	65	Medical Milk Commission of Boston.	Boston.
Oaks Farm, Cohasset,	C. W. Barron, owner, W. E. Stilwell, manager.	50	Medical Milk Commission of Cohasset.	Cohasset.
Prospect Hill Farm, Essex.	J. A. & W. H. Gould,	175	Medical Milk Commission of Boston.	Boston, Brookline, Jamaica Plain, North Shore.
Seven Gates Farm, North Tisbury.	W. L. Webb, owner, O. L. Curtis, manager.	20-25	Medical Milk Commission of West Tisbury, Inc.	Marthas Vineyard.
W. C. White's farm, Acushnet.	Walter C. White, .	28	New Bedford Medical Commission.	New Bedford.

LIST OF LOCAL MILK INSPECTORS.

Milk Inspectors for Massachusetts Cities, 1913.

Beverly,	Henry E. Dodge, 2d.
Boston,	Prof. James O. Jordan.
Brockton,	George E. Bolling.
Cambridge,	Dr. W. A. Noonan.
Chelsea,	Dr. W. S. Walkley.
Chicopee,	C. J. O'Brien.
Everett,	E. Clarence Colby.
Fall River,	Henry Boisseau.
Fitchburg,	John F. Bresnahan.
Gloucester,	Dr. George E. Watson.
Haverhill,	Dr. Homer L. Conner.
Holyoke,	Daniel P. Hartnett.
Lawrence,	Dr. J. H. Tobin.
Lowell,	Melvin F. Master.
Lynn,	George A. Flanagan.
Malden,	J. A. Sandford.
Marlborough,	John J. Cassidy.
Medford,	Winslow Joyce.

Melrose,	Caleb W. Clark, M.D.
New Bedford,	Herbert B. Hamilton, D.V.S.
Newburyport,	Dr. R. D. Hamilton.
Newton,	Arthur Hudson.
North Adams,	Henry A. Tower.
Northampton,	George R. Turner.
Pittsfield,	Eugene L. Hannon.
Quincy,	Edward J. Murphy.
Salem,	John J. McGrath.
Somerville,	Herbert E. Bowman.
Springfield,	Stephen C. Downs.
Taunton,	Lewis I. Tucker.
Waltham,	Arthur E. Stone, M.D.
Woburn,	Edward P. Kelly, M.D.
Worcester,	Gustaf L. Berg.

Milk Inspectors for Massachusetts Towns, 1913.

Adams,	Dr. A. G. Potter.
Amesbury,	E. S. Worthen.
Andover,	Franklin H. Stacey.
Arlington,	Dr. L. L. Pierce.
Attleborough,	Caleb E. Parmenter.
Barnstable,	George T. Mecarta.
Belmont,	Thomas F. Harris.
Brookline,	Frederick H. Osgood.
Canton,	R. N. Hoyt.
Clinton,	Gilman L. Chase.
Cohasset,	Dr. D. W. Gilbert, D.V.S.
Concord,	Joseph Dee, Jr.
Dedham,	Edward Knobel.
Easthampton,	George L. McEvoy.
Fairhaven,	Bertha F. Carl Frommel, M.D.
Framingham,	R. N. Hoyt.
Gardner,	Clifford W. Shippee.
Greenfield,	George P. Moore.
Hudson,	Dr. A. L. Cundall.
Lancaster,	George E. Howe.
Leominster,	William H. Dodge.
Ludlow,	A. L. Bennett, D.V.S.
Marblehead,	Andrew W. Stone.
Middleborough,	T. F. Conway.
Millbury,	Arthur A. Brown.
Milton,	W. C. Tucker.
Monson,	Dr. E. W. Capen.
Needham,	R. N. Hoyt.
North Attleborough,	Hugh Gaw, V.S.
Palmer,	Edward P. Brown.
Peabody,	H. S. Pomeroy, M.D.

Plainville,	John C. Eiden.
Reading,	C. H. Playden, M.D.
Revere,	Joseph E. Lamb.
Salisbury,	John H. Pike.
Southbridge,	Albert R. Brown.
South Framingham,	Dr. J. H. McCann.
South Hadley Falls,	George F. Boudreau.
Spencer,	James A. Spencer.
Stoneham,	George H. Allen.
Swampscott,	Herbert D. Smith.
Wakefield,	Harry A. Simmonds.
Ware,	Fred E. Marsh.
Watertown,	Luther W. Simmonds.
Wellesley,	R. N. Hoyt.
Westborough,	Charles H. Reed.
Westfield,	William H. Porter.
Weston,	R. N. Hoyt.
West Springfield,	Norman T. Smith.
Williamstown,	G. S. Jordan, V.S.
Winchendon,	Dr. G. W. Stanbridge.
Winchester,	Morris Dineen.
Winthrop,	Smith A. Mowray.

CREAMERIES, MILK DEPOTS, ETC.

Co-operative Creameries.

NUMBER AND LOCATION.	Name.	Superintendent or Manager.
1. Ashfield,	Ashfield Creamery,	William Hunter, manager.
2. Belchertown,	Belchertown Creamery,	M. G. Ward, president.
3. Cummington,	Cummington Creamery,	D. C. Morey, superintendent.
4. Easthampton,	Hampton Creamery,	E. B. Clapp, treasurer.
5. Egremont (P. O. Great Barrington).	Egremont Creamery,	E. G. Tyrell, manager.
6. Monterey,	Berkshire Hills Creamery,	F. A. Campbell, treasurer.
7. Northfield,	Northfield Creamery,	C. C. Stearns, treasurer.
8. Shelburne,	Shelburne Creamery,	Ira Barnard, manager.
9. Westfield,	Wyben Springs Creamery,	C. H. Kelso, manager.

Proprietary Creameries.

NUMBER AND LOCATION.	Name.	Owner or Manager.
1. Amherst,	Amherst Creamery Company,	R. W. Pease, manager.
2. Amherst,	Fort River Creamery,	Clarence M. Wood, manager (estate of E. A. King, owner).
3. Brimfield,	Crystal Brook Creamery,	F. N. Lawrence, proprietor.
4. Heath,	Cold Spring Creamery,	I. W. Stetson & Son.
5. Hinsdale,	Hinsdale Creamery,	Walter C. Solomon, proprietor.

Educational.

LOCATION.	Name.	Manager.
Amherst, ...	Dairy Industry Course, Massachusetts Agricultural College.	W. P. B. Lockwood, professor in charge.

Principal Milk-distributing Depots.

NAME.	Location.	Manager.
Acton Farms Milk Company.	Somerville, Windsor Street, . .	Arthur B. Parker, treasurer.
Alden Brothers Company, Oak Grove Farm, Waumesit Farm.	Boston office, 1171 Tremont Street, depot, 24-28 Duncan Street.	Charles L. Alden, president, John Alden, treasurer.
Anderson Brothers, . .	Worcester, Eckman Street, . .	Anderson Bros.
Boston Condensed Milk Company.	Boston, 484 Rutherford Avenue, .	W. A. Graustein.
Brigham, C., Company, .	Cambridge, 158 Massachusetts Avenue.	John K. Whiting.
Brigham, C., Company, .	Worcester, 9 Howard Street, . .	C. Brigham Company.
Deerfoot Farms Dairy, .	Boston office, 9 Bosworth Street, depots at Northborough and Southborough.	S. H. Howes.
Elm Farm Milk Company,	Boston, Wales Place, . . .	James H. Knapp, treasurer.
Hood, H. P., & Sons, .	Boston, 494 Rutherford Avenue; branches, 24 Anson Street, Forest Hills, 886 Broadway, Chelsea.	Charles H. Hood.
	Lynn, 193 Alley Street, . . .	
	Malden, 425 Main Street, . .	
	Watertown, 479 Pleasant Street, .	
	Lawrence, 629 Common Street, .	
Learned, G. S. (Fitchburg Creamery).	Fitchburg, 26 Cushing Street, .	G. S. Learned.
Newhall, J. A., ...	Newburyport, 32 Munroe Street, .	J. A. Newhall.
Perry, A. D., ...	Worcester, Kansas Street, . .	A. D. Perry.
Prentice, H. H., & Co. (Berkshire Creamery).	Pittsfield, Crane Avenue, . .	H. H. Prentice.
Somers Creamery Company,	Springfield, 178 Dwight Street, .	W. M. Cushman.
Springfield Creamery, .	Springfield, Main Street, . .	F. B. Allen, proprietor.
Tait Brothers, . . .	Springfield, 37 Vinton Street, .	Tait Brothers, proprietors.
Wachusett Creamery, .	Worcester, 6 Lincoln Street, . .	E. H. Thayer & Co., proprietors.
Whiting, D., & Sons, .	Boston, 570 Rutherford Avenue, .	George Whiting.

Milk Laboratory.

Walker-Gordon Laboratory,	Boston, 793 Boylston Street, .	George W. Franklin.

Receiving Depot for Milk, for Shipments to New York City.

Willow Brook Dairy Company.	Sheffield, ...	Frank Percy.

ENCOURAGEMENT OF DAIRYING EXPENSES, AUGUST TO NOVEMBER.

Printing,	$51 18
Agents: compensation,	183 35
Agents: expenses,	426 29
Judges: expenses,	24 45
Photography,	55 80
Supplies,	93 74
Total expenses,	$834 81
Prizes,	3,000 00
Total expenditures,	$3,834 81

REGULAR BUREAU EXPENSES.

The following is a classified statement of the expenses for the year ending Nov. 30, 1913: —

Bureau: compensation and traveling expenses,	$496 36
Agents: compensation,	3,010 62
Agents: traveling expenses and samples purchased,	2,612 63
General agent: traveling and necessary expenses,	263 33
Analysts: analyses, tests, court attendance,	929 50
Printing and supplies,	511 06
Educational,	176 50
Total,	$8,000 00

P. M. HARWOOD,
General Agent.

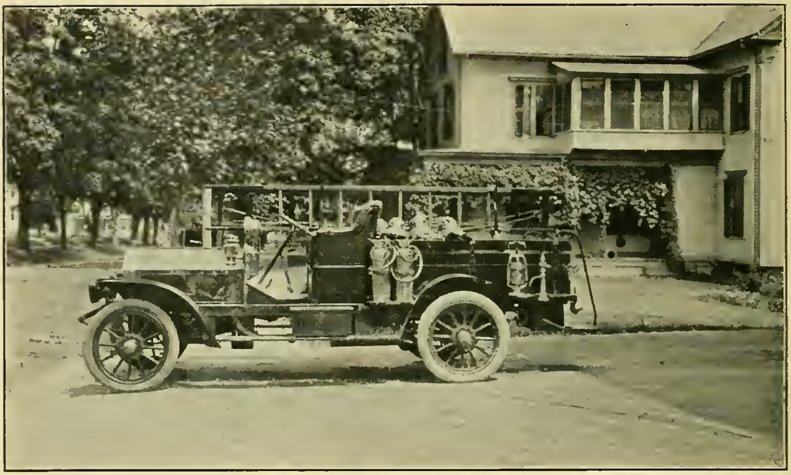
Accepted and adopted as the report of the Dairy Bureau.

CHARLES M. GARDNER.
GEORGE W. TRULL.
O. E. BRADWAY.

TENTH ANNUAL REPORT

OF THE

STATE FORESTER.



The town of Winchendon forest fire auto truck. Has carried ten men and necessary equipment. It is also used as an auxiliary hose truck for house fires. By an ingenious arrangement the hose-reel and box containing hand extinguishers are quickly interchangeable, and hence the truck serves a double purpose. Cost of truck, $1,000.

A four-year plantation of Scotch pine, planted by the Murdock Company of Winchendon. The whole farm was purchased for the value of its wood growth, and the run-out fields, as here shown, have been planted. This farm is located in Ashburnham. A good example of what the Winchendon manufacturers are doing They also plant cut-over lands in the same way.

TENTH ANNUAL REPORT OF THE STATE FORESTER.

Introduction.

With this report the office of State Forester completes the first decade of its existence. It is a pleasure at this time not only to report upon the activities and accomplishments of the year just closing, but to also call brief attention to our ten years of sturdy growth and our increasing usefulness to this grand old Bay State, whose natural resources we are striving to protect and augment. The people of Massachusetts are second to none in public sentiment, and now that forestry is definitely recognized as of fundamental importance to both our economic and æsthetic development, in what direction, may I ask, should our efforts toward usefulness tend during the next ten years?

Let us all have a hand in this most promising and captivating work, and I am sure that future decades as they roll by will each point to the earnest beginning of this generation.

If our interest in the work maintains its steady growth throughout the State, the next ten years will accomplish far more than most people realize, and hence even we, ourselves, may live to enjoy some of the first fruits of our labors.

It is proverbial that we Americans are rather deliberate and desire to get our bearings before we really set ourselves to a task, but once satisfied we are right, then we break all precedent in our ability to accomplish results. What Germany, Austria, France, Denmark, Belgium and other countries have taken centuries to learn, we can quickly adopt and put into practice. To allow 1,000,000 acres of depleted and waste lands to lie idle in a live and progressive State like Massachusetts, where the markets are the best in the world, is accounted for only by the fact that forest products, like all other natural resources, have been cheap in the immediate past, it being necessary only to harvest the crop. From now on we shall find it necessary to plant and grow the crop to secure us a harvest.

Besides the 1,000,000 acres of so-called waste land capable of reforestation, it is estimated that there are 2,000,000 more in forests of varying conditions, one-half of which, it is safe to say, comprises sprout or scrub growth of little financial value, while the remainder is in merchantable condition.

This office has made sufficient study of the growth of white pine alone to show that, at present prices even, we might in the future, under modern forestry practices, cut lumber annually that would yield millions of dollars to this Commonwealth.

Most of our people think that Massachusetts is so depleted and cut over from a forestry standpoint that we are in a very humiliating position, and they are right; and yet our scattered remnants of forests continue to supply trees enough to keep 300 sawmills, mostly of the portable type, busily engaged every day throughout the year in some section of the State. The lumber produced in the State to-day, therefore, is a very great asset, probably approximately 500,000,000 feet, board measure, and representing an annual investment of $15,000,000 and a net profit of from $2,500,000 to $7,500,000 to our people.

It is estimated that we grow only 5 per cent of the forest products used in the State. Massachusetts is a busy and bustling manufacturing center, and her demands for lumber and other forest products are no small matter. A bulletin — the first of its kind to be published in this country — has been issued by the State Forester and contains a list of our various wood-using industries, their location throughout the State, the kinds of forest products used, the finished product and other very interesting information. At the present time we are drawing on Washington and Oregon at almost prohibitive prices for our better soft woods, and from the Carolinas and Tennessee for our hard woods; but may we pause to ask where shall our mill owners turn next, once these virgin sources are depleted. Surely, we must feather our nest now while we can depend upon the outside supply, so that when this begins to ebb we may be able to turn to our own home-grown products.

It costs $20 or more a thousand to ship lumber from the

Pacific Coast to us, and we can plant, grow, harvest and make a profit right here at home for this expenditure.

As State Forester, I desire to see our people enthused on such a broad and comprehensive scale in reforestation and the practice of modern forestry methods as to make this old Bay State a veritable forest park from the tip of Cape Ann to the town of Mount Washington, and from the summit of Greylock Mountain to Provincetown and our islands in the sea. Let the slogan, "Boost forestry!" prevail everywhere.

Our lumbermen without exception are everywhere practicing more economic methods, especially upon the properties owned by them; boards of trade and merchant associations are recognizing the importance of better forestry as a great future asset to their respective sections, while clubs and other organizations are surely no less interested.

The Massachusetts State Forestry Association, which has a permanent paid secretary who gives his whole time to the work of the association, has found more real interest in forests and trees on the part of our people generally throughout the past year than has been shown heretofore. The membership alone, which is entirely voluntary, is indicative of the present interest, having increased from 1,800 to 3,200. The membership was only 800 three years ago. It is needless to point out that this association has been and is of valued assistance to the State Forester; in fact, it was this organization that labored so diligently for forestry in the decades before this office was created.

The State Board of Agriculture, backed by its strong constituency of agricultural societies, which represent the rural industries of most of our stalwart farming sections, is also showing splendid interest in forestry.

The Massachusetts State Grange, our own order of Patrons of Husbandry, which is recognized in every rural community in Massachusetts as life-giving and comprising a social center, has been of great help to this department as a medium for getting into personal touch with landowners interested in our work. It was the enthusiastic support of the State Grange, I am frank to say, that aided as much as any one factor in the enactment of our present and most efficient forest fire permit law.

The Federation of Woman's Clubs, it is needless to point out, has ever been in the front rank in promoting better forestry.

So I might continue to elaborate upon the good will and assistance of organizations and associations which are aiding the State Forester in his work; but suffice it to say that we appreciate their co-operation and trust in its continuance. We feel sure of this continued co-operation, since our cause is so worthy and so dear to the hearts of all of us.

Activities of the Department.

The work that was so fully outlined in the introduction of last year's report I refrain from again reviewing here. While we thought our activities were many and effective at that time we are frank to confess that during the past twelve months the work has increased, both in new directions and in the enlargement of old methods. The number of observation or look-out stations for forest fires was increased from 18 to 21, and the State Fire Warden's work strengthened in every way. The inspection of railroad locomotives has been conducted for the first time by our own men, which co-operation has resulted in far better service, in improved spark arresters and ash pans.

The chestnut blight work was greatly augmented by our being able, through the continued co-operation with the United States Department of Agriculture, to secure the services of Mr. Roy G. Pierce, a graduate in forestry who had been in the employ of the Pennsylvania Chestnut Blight Commission until that work was discontinued. Mr. Pierce has entered heartily into the State Forester's plans, and it is believed that our activities have been recognized in every section where the chestnut grows. A report on "Chestnut Blight" published elsewhere will be of interest.

The activities in the moth work have been fully as encouraging as any phase of the State Forester's undertakings. Notwithstanding the fact that we are spending $115,000 less than we were two years ago, the work has gone on with equal efficiency. We have studied carefully the conditions of each city and town, and our efforts, due to more experience on the part of both State and local officials, have resulted in far greater efficiency and economy.

The introduction of sylvicultural methods and better forestry practices has made the outlook in moth suppression more encouraging than at any previous time. Step by step, each year seems to give us a new vantage point in the moth work, and while it is conceded by all experts that our problem is now one of suppression and not extermination, we in this State are prepared to handle the problem in the most rational and economic way. The moth work in our cities and towns is resolving itself down to a definite business undertaking in which each is lessening its expenditures in proportion to the thoroughness with which the work is done each year. Towns and cities alive and active are beginning already to look with relatively little concern on the problem, especially throughout their residential sections. Woodlands are also being properly managed by this department as regards the gypsy and brown-tail moths, and with a greater degree of success than ever.

During the stripping stage of the gypsy moth this year we notified all the division superintendents to list all forest properties within their respective territories thus affected, and to report the names of the owners, the location of the tracts and the number of acres stripped. Upon receipt of these data a notice was sent each landowner in which the services of a trained forester were offered, at no expense, to meet the said owner and advise him, on the ground, as to the best methods of management to pursue. The only condition on the part of the owner was that he sign and return the request and plan to carry out the meeting. This work is the continuation of that alluded to under the heading, "Better Forestry the Solution of the Moth Problem," in last year's report.

The scheme has worked out marvelously, and over 300 requests have been received for examinations and advice, and they are still coming in. Mr. Paul Kneeland, who succeeded Mr. H. F. Gould, the latter resigning to go into private forestry work, has organized and carried out this work with the aid of Mr. Smith and certain of the division superintendents, until at the present time he has examined 10,000 acres. Already forestry operations have resulted in actually carrying out the work on 1,000 acres. At the present time, organized operations in improvement cuttings are being practiced in 12 different places. The results of this work, together with more detailed information as to cost, etc., will be given elsewhere in this report.

The parasite work has already begun to show very good results, as must be evidenced by all casual observers. Particularly is this true in the case of the imported calosoma beetle, which, in both the adult or beetle and the larval stages, was extremely numerous this past year. In neglected woodlands, where the moths were bad, the writer is of the opinion that the calosoma destroyed at least one-tenth of the moths present. Other parasites are reported upon elsewhere by Dr. L. O. Howard, United States Entomologist, who has co-operated with us.

Of the mechanical methods of suppression, spraying with arsenate of lead is still one of the great factors in our hands for ameliorating conditions. Several more towns have added high-power spraying machines during the year.

Approximately 750 tons of arsenate of lead were used throughout the season. The Metropolitan Water and Sewerage Board purchased an auto truck sprayer the past season, which makes the third now in use.

The plans for enlarging the output from our nurseries, through utilizing the labor of some of our State penal institutions, are very promising indeed. Three acres of transplant stock were set out on land turned over to the State Forester for this purpose on the land of the State Farm at Bridgewater this fall, and Captain Blackstone, the superintendent of the institution, has promised us enough more land to make 10 acres in all by next spring.

The Foxborough State Hospital is also preparing a plot for a nursery on a very conspicuous site along the State highway at Norfolk, and it is believed this institution, through its being able to co-operate in aiding the State in the work of reforestation, can render splendid service to the State. Dr. Neff, the superintendent, and the board of trustees are all very enthusiastic over the undertaking. The State Forester's nursery at Amherst is as great a success as ever, and our total capacity is estimated at about 7,000,000 seedlings and transplants at the present time. We have donated several hundred thousand to various State institutions, as the nursery report will show. This is printed elsewhere in the report.

The last General Court created, and Governor Foss appointed, a commission on the taxation of waste and forest lands. This commission has been arduously at work holding hearings throughout the State and making a study of the subject during the summer and fall. These deliberations will be incorporated into a bill to be submitted to the incoming Legislature for its approval. I am sure we will all welcome a more wholesome and definitely regulated system of taxation, to encourage the practice of modern forestry in the State.

Our present method of leaving slash after lumbering operations continues to be one of our greatest menaces, and results in constant loss and damages to forest property owners. In talking with some of our best lumbermen it is generally agreed that if we were to require that the slash be disposed of, it would do more for future forestry possibilities in the State than any other one thing. Our really great forest-fire losses are inevitably caused, not by the average fire that is found in the woods, but from the fact that these fires occasionally reach large bodies of slash where they get the momentum that becomes uncontrollable. The time is bound to come when this slash menace must be regulated. Why not give it due consideration at the present time?

It is believed that the time is ripe for the State to enlarge upon its forest policy to the extent of establishing State forests. The work under our reforestation act has been a pronounced success and very useful as a beginning, but we need a much more pretentious undertaking to do justice to the needs of the State. Massachusetts surely can afford as extensive a policy as many other States are practicing. With our present outlook in utilizing the State institutions for growing our small trees cheaply, we could reforest and manage large tracts of present worthless or waste lands in a practical and economic way. I would respectfully urge the incoming Legislature to give this subject due consideration.

Organization.

It has been my purpose to have the organization of the State Forester's department composed of loyal, wide awake, enthusiastic, experienced men.

A clear-cut organization, in which each official not only has a definite field of usefulness but is alert and full of enthusiastic interest, is absolutely necessary to success at our present stage of forestry development. We now have a corps of men familiar with tree and forest conditions throughout the State. The various divisions of the department are in charge of trained men; foresters for the most part, but a few so-called practical men, have been developed, there being no trained foresters of experience and efficiency available. The State policy is to utilize the whole organization in the bettering of our forestry conditions, and while each employee has his definite routine of duty to perform, he at the same time intuitively assists in the control of all forest depredations, such as fires, insects and diseases. While our men are not all experts in entomology or mycology, nevertheless they are familiar with the fundamentals in these sciences, and expert enough to observe new and extraordinary conditions. Where experts are needed they are delegated to direct the task, but they in turn utilize the State Forester's general organization as auxiliary in the work.

The splendid organization of forest wardens and moth superintendents, one in each town and city, forms an army of public-spirited men who become more efficient each year, and therefore of greater value to the community. There are 353 forest wardens, with over 1,000 deputies, and 282 moth superintendents throughout the State.

There were a few changes in the staff of assistants the past year, as is inevitable each year.

Mr. H. F. Gould, who had been an assistant for several years in forestry management, resigned to engage in forestry work as general manager of the Franklin Forestry Company. It was with reluctance that we parted with his services, as his work was certainly appreciated and of a high order. Mr. Gould had been placed in charge of the work of forestry management as applied to moth control, and he very kindly remained with us several weeks after the term of his resignation, in order that his successor, Mr. Paul D. Kneeland, could get the work sufficiently in hand. This was highly appreciated by the State Forester.

Mr. Paul D. Kneeland, who succeeded Mr. Gould, is a graduate of the Harvard Forestry School, and has had experience in the United States Forest Service in the west, and has been in the employ of Fisher, Bryant & Olmstead of Boston, foresters.

Miss Charlotte Jacobs, who was the State Forester's only assistant and stenographer when he first came to his present position in the State, resigned last spring after seven years' faithful service. Her regularity, thoroughness and enthusiastic interest in the work of the department are missed.

The office of inspector in the moth work has been discontinued, this going into effect on August 1 last. The office of local moth superintendent has so increased in efficiency that it was found unnecessary to incur this extra expense longer.

The remainder of the organization remains practically intact, the work being shifted more or less to suit our greatest needs.

The organization at present is as follows: —

General Staff.

F. W. Rane, B.Agr., M.S.,	State Forester.
H. O. Cook, M.F.,	Assistant Forester.
M. C. Hutchins,	State Fire Warden.
George A. Smith,	Assistant, moth work.
R. S. Langdell,	Assistant, reforestation.
Paul D. Kneeland, M.F.,	Assistant moth work.
W. D. Clark, M.F.,	Assistant, Massachusetts Agricultural College.
Roy G. Pierce, M.F.,	Assistant, chestnut blight work.
Frank L. Haynes, B.F.,	Assistant, forestry management.
John Murdoch, Jr., M.F.,	Assistant, moth work.
Charles O. Bailey,	Secretary.
Elizabeth Hubbard,	Bookkeeper.
Elizabeth T. Harraghy,	Stenographer.
Josepha L. Gallagher,	Clerk.
Frank Garbarino,	Office boy.

Staff, Forest Fire Prevention.

F. W. Rane,	State Forester.
Maxwell C. Hutchins,	State Fire Warden.
Miner E. Fenn,	Assistant.
James E. Moloy,	Locomotive inspector.
Oscar L. Noyes,	District Forest Warden No. 1.
J. J. Shepherd,	District Forest Warden No. 2.
John P. Crowe,	District Forest Warden No. 3.
Albert R. Ordway,	District Forest Warden No. 4.

Observers and Observation Stations.

District 1: —

Wm. Bray,	Bald Pate Hill, Georgetown.
M. L. Carpenter,	Moose Hill, Sharon.
Henry Fay,	Hart Hill, Wakefield.
J. Frank Hammond,	Robbins Hill, Chelmsford.
Elliot C. Harrington,	Blue Hill, Milton.
Caplis McCormick,	Morse Hill, Essex.

District 2: —

Calvin Benson,	Shoot Flying Hill, Barnstable.
Frank L. Buckingham,	Reservoir Hill, Plymouth.
Walter L. Eames,	Richmond Hill, Dighton.
S. Matthews,	Middleborough.
Cushing O. Thomas,	Bonney Hill, North Hanson.

District 3: —

A. M. Bennett,	Lincoln Mountain, Pelham.
W. J. Halloran,	Fay Mountain, Westborough.
F. H. Lombard,	Grace Mountain, Warwick.
James Maley,	Wachusett Mountain, Princeton.
Harold McKinstry,	Little Muggett Hill, Charlton.
George W. Sherman,	Steerage Rock Mountain, Brimfield.

District 4: —

Claude E. G. Cain,	Tower Mountain, Savoy.
James S. Rose,	Becket Mountain, Becket.
Geo. C. Miller,	Mount Tom, Easthampton.
Nelson C. Woodward,	Massaemet Mountain, Shelburne.

Staff, Moth Work.

F. W. Rane,	State Forester.
George A. Smith,	Assistant.

Paul D. Kneeland, Assistant, forestry moth work.
John Murdoch, Jr., Assistant, forestry moth work.
Francis V. Learoyd, in charge of supply store.
Frederick P. Halpin and Claude E. Towle, Mechanics.
John F. Lanergan, Assistant at supply store.
John W. Enwright, District 1, 299 Fellsway, Medford.
Saul Phillips, District 2, Box 266, Beverly.
John J. Fitzgerald, District 3, 50 Howard Street, Haverhill.
William A. Hatch, District 4, Lakeside Ave., Marlborough.
Harry B. Ramsey, District 5, 27 Duxbury Road, Worcester.
Clarence W. Parkhurst, District 6, Box 472, Medfield.
Walter F. Holmes, District 7, 181 Allen Street, E. Braintree.
John A. Farley, District 8, Plymouth, R. F. D.

Co-operative Scientific Staff.

L. O. Howard, Ph.D.,	Chief, Bureau of Entomology, United States Department of Agriculture, Washington, D. C., parasites and predaceous insects.
Theobald Smith, Ph.B., M.D.,	Professor of Comparative Pathology, Harvard University, diseases of insects.
Roland Thaxter, Ph.D.,	Professor of Cryptogamic Botany, Harvard University, fungous diseases affecting insects.
W. M. Wheeler, Ph.D.,	Professor of Entomology, Harvard University, experimental entomologist.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS.

[Alphabetically by towns and cities.]

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
57-W, Rockland,	Arthur B. Reed,	**Abington,**	C. F. Shaw,	8
10-4,	W. H. Kingsley,	**Acton,**	J. O'Neil,	5
2003-M,	Henry F. Taber,	**Acushnet,**	A. P. R. Gilmore,	9
2-0, Kippers,	John Clancy,	**Adams,**	John Clancy,	6
3165-11,	E. M. Hitchcock,	**Agawam,**	- -	-
151-32, Great Barrington.	J. H. Wilcox, State Line,	**Alford,**	- -	-
274-M,	James E. Feltham,	**Amesbury,**	A. L. Stover,	3
174-Y,	A. F. Bardwell,	**Amherst,**	W. H. Smith,	6
212,	John H. Baker,	**Andover,**	J. H. Playdon,	4
35 or 206,	Walter H. Pierce,	**Arlington,**	W. H. Bradley,	1
2-12,	J. T. Withington,	**Ashburnham,**	Chas. H. Pratt,	5
8014,	Wm. S. Green,	**Ashby,**	Fred C. Allen,	5
4-12,	Chas. A. Hall,	**Ashfield,**	- -	-
479-W,	Horace H. Piper,	**Ashland,**	M. Geoghan,	7
48-J or 72-4,	Frank P. Hall,	**Athol,**	W. S. Penniman,	6
34-4,	Hiram R. Packard,	**Attleborough,**	W. E. S. Smith,	7
5-17,	J. F. Searle,	**Auburn,**	J. F. Searle,	6
3259-M,	J. W. McCarty,	**Avon,**	W. W. Beals,	8
96-4 or 47-4,	Chas. E. Perrin,	**Ayer,**	D. C. Smith,	5
144-2,	Henry C. Bacon, Hyannis,	**Barnstable,**	H. W. Bodfish,	9
83-4,	A. E. Traver,	**Barre,**	G. R. Simonds,	6
11-4,	P. B. McCormick,	**Becket,**	- -	-
No telephone,	Chas. E. Williams,	**Bedford,**	W. A. Cutler,	1
10,	Jas. A. Peeso,	**Belchertown,**	E. C. Howard,	6
8157-22, Milford,	L. Francis Thayer,	**Bellingham,**	H. A. Whitney,	7
409-W,	John F. Leonard,	**Belmont,**	C. H. Houlahan,	1
1367-M,	G. H. Babbitt, Taunton, R. F. D.	**Berkley,**	J. M. Alexander,	7
14-6,	Walter Cole,	**Berlin,**	E. C. Ross,	5
2-13,	Edson W. Hale,	**Bernardston,**	Edwin B. Hale,	6
319-2,	Robert H. Grant,	**Beverly,**	J. B. Brown,	2
22-2,	E. N. Bartlett,	**Billerica,**	W. H. O'Brien,	4
875-L-1, Woonsocket.	Thomas Reilly,	**Blackstone,**	A. J. Gibbons,	6
12-2,	I. E. Whitney,	**Blandford,**	- -	-
9-14,	E. Eliot Hurlbut,	**Bolton,**	C. E. Mace,	5
- -	- -	**Boston,**	D. H. Sullivan,	1
- -	Emory A. Ellis, Bournedale.	**Bourne,**	Edward D. Nickerson,	9
No telephone,	H. J. Livermore,	**Boxborough,**	C. E. Sherry,	5

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

Telephone Number.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
42-21, Georgetown.	Harry L. Cole, Georgetown, R. F. D.	**Boxford,**	C. Perley,	3
4-4,	John N. Flagg,	**Boylston,**	R. B. Smith,	6
No telephone,	Jas. M. Cutting, South Braintree.	**Braintree,**	Clarence R. Bestick.	8
No telephone,	T. B. Tubman,	**Brewster,**	Russell D. Eaton,	9
8-6,	Edwin S. Rhoades,	**Bridgewater,**	A. W. MacFarland,	8
14-3,	Geo. E. Hitchcock,	**Brimfield,**	G. E. Hitchcock,	6
1041 or 2020,	Harry L. Marston,	**Brockton,**	E. P. Neafsey,	8
101-13,	Elbert L. Bemis,	**Brookfield,**	J. H. Conant,	6
376,	Geo. H. Johnson,	**Brookline,**	Ernest B. Dane,	1
Lampson & Goodnow Mfg. Co.	Wm. Sauer, Shelburne Falls.	**Buckland,**	- -	-
2-2,	W. W. Skelton,	**Burlington,**	W. W. Skelton,	1
51-4,	Robert C. Hughes,	**Canton,**	A. Hemenway,	8
- -	- -	**Cambridge,**	J. F. Donnelly,	1
76-5, Concord,	Geo. G. Wilkins,	**Carlisle,**	G. G. Wilkins,	1
16-2,	Herbert F. Atwood,	**Carver,**	H. F. Atwood,	9
10,	Edwin C. Vincent,	**Charlemont,**	- -	-
32-22,	Chas. S. McKinstry,	**Charlton,**	J. D. Fellows,	6
28-3,	Geo. W. Ryder, West Chatham.	**Chatham,**	Meroyn R. Martin,	9
1597-4, Lowell,	Arnold C. Perham,	**Chelmsford,**	M. A. Bean,	4
- -	- -	**Chelsea,**	J. A. O'Brien,	1
167-3,	Chas. D. Cummings,	**Cheshire,**	- -	-
33-2,	Myron E. Turner,	**Chester,**	- -	-
8004,	Chas. A. Bisbee, Bisbees,	**Chesterfield,**	- -	-
149-11 or 149-W,	John E. Pomphret,	**Chicopee,**	Z. Pilland,	6
No telephone,	Ernest C. Mayhew,	**Chilmark,**	A. S. Tilton,	9
No telephone,	Danforth Blanchard, North Adams, R. F. D.	**Clarksburg,**	Geo. Tisdale,	6
551-M,	Patrick H. Kelley,	**Clinton,**	John B. Connery,	5
177-3 or 260,	Wm. J. Brennock,	**Cohasset,**	Wm. H. McArthur,	8
13-12,	J. D. Gilchrest, Griswoldville.	**Colrain,**	- -	-
75-3,	Frank W. Holden,	**Concord,**	H. P. Richardson,	5
5-3,	Edgar Jones,	**Conway,**	- -	-
8001,	Thos. A. Gabb,	**Cummington,**	- -	-
57-11,	S. L. Caesar,	**Dalton,**	- -	-
No telephone,	Thos. L. Thayer, North Dana.	**Dana,**	T. L. Thayer,	6
295-W,	Michael H. Barry,	**Danvers,**	T. E. Tinsley,	2
14-3, Westport,	Ezekiel W. Reed, North Dartmouth.	**Dartmouth,**	E. M. Munson,	9
35-R,	H. J. Harrigan,	**Dedham,**	J. T. Kennedy,	7
273-14, Greenfield,	Wm. L. Harris,	**Deerfield,**	- -	-

List of Forest Wardens and Local Moth Superintendents — *Con.*

Telephone Number.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
No telephone,	Alpheus P. Baker,	**Dennis,**	H. H. Sears,	9
29-3,	Ralph Earle,	**Dighton,**	D. F. Lane,	7
11-4,	Wm. L. Church,	**Douglas,**	F. J. Libby,	6
373-3,	John Breagy,	**Dover,**	H. L. McKenzie,	7
3353-2,	Frank H. Gunther,	**Dracut,**	T. F. Carrick,	4
152-2, Webster,	F. A. Putnam,	**Dudley,**	Frank W. Bateman.	6
5-11, Tyngsborough.	Archie W. Swallow,	**Dunstable,**	W. H. Savill,	4
- -	Eden W. Soule,	**Duxbury,**	H. A. Fish,	9
146-5,	Richard H. Copeland, Box 115, Elmwood.	**E. Bridgewater,**	Frank H. Taylor,	8
8-5,	Asher Markham,	**E. Longmeadow,**	- -	-
24-3,	Adin L. Gill,	**Eastham,**	N. P. Clark,	9
2-11,	J. M. Dineen,	**Easthampton,**	- -	-
76,	Frederick Hanlon, North Easton.	**Easton,**	R. W. Melendy,	7
241-2,	Manuel S. Roberts,	**Edgartown,**	John P. Fuller,	9
165-25,	Frank W. Bradford, Great Barrington.	**Egremont,**	- -	-
2-11,	Herbert A. Coolbeth,	**Enfield,**	C. H. Moore,	6
No telephone,	Chas. H. Holmes, Farley.	**Erving,**	Chas. H. Holmes,	6
23-5,	Otis O. Story,	**Essex,**	O. O. Story,	2
- -	- -	**Everett,**	J. Davidson,	1
675-R or 675-W,	Wm. P. Shaw,	**Fairhaven,**	G. W. King,	9
822-W,	Wm. Stevenson,	**Fall River,**	Wm. Stevenson,	9
136-2,	H. H. Lawrence, Teaticket.	**Falmouth,**	W. B. Bosworth,	9
745 or 148-J,	W. W. Colton,	**Fitchburg,**	W. W. Colton,	5
Hoosac Tunnel pay station.	H. B. Brown, Drury,	**Florida,**	- -	-
15-5 or 76-3,	Ernest A. White,	**Foxborough,**	F. S. Richardson,	7
352-4 South Framingham.	B. P. Winch,	**Framingham,**	N. I. Bowditch,	7
66-12,	Edward S. Cook,	**Franklin,**	J. W. Stobbart,	7
3-12,	Andrew Hathaway, Assonet.	**Freetown,**	G. M. Nichols,	9
191-M,	Geo. S. Hodgman,	**Gardner,**	T. W. Danforth,	6
- -	Leander B. Smalley, Menemsha.	**Gay Head,**	J. W. Belain,	9
31-4,	Clinton J. Eaton,	**Georgetown,**	C. J. Eaton,	3
4-15, Bernardston,	Lewis C. Munn, Turners Falls.	**Gill,**	A. Tuttle,	6
547-5,	Sydney F. Haskell,	**Gloucester,**	H. J. Worth,	2
18-4,	John S. Mollison, Williamsburg.	**Goshen,**	- -	-
No telephone,	Rodney E. Bennett,	**Gosnold,**	- -	-
8000,	Sumner F. Leonard,	**Grafton,**	C. K. Despeau,	6
55-4,	C. N. Rust,	**Granby,**	Chas. N. Rust,	6
4-12,	Harry A. Root,	**Granville,**	- -	-

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
5-W,	Daniel W. Flynn,	**Gt. Barrington,**	T. J. Kearin,	6
439-J,	J. W. Bragg,	**Greenfield,**	J. W. Bragg,	6
33-24 Enfield,	Wm. H. Walker, Greenwich Village.	**Greenwich,**	E. A. Sawtelle,	6
– –	Chas. M. Raddin,	**Groton,**	J. F. Bateman,	4
2939-X,	Sidney E. Johnson,	**Groveland,**	R. B. Larive,	3
651-33,	Edward P. West,	**Hadley,**	Edw. P. West,	6
5-21,	Albion D. Estes,	**Halifax,**	F. D. Lyons,	9
128-2,	Fred Berry, Essex, R. F. D.	**Hamilton,**	E. G. Brewer,	2
– –	Edward P. Lyons,	**Hampden,**	– –	–
17-F-2,	Chas. F. Tucker,	**Hancock,**	– –	–
8175-12,	Chas. E. Damon, North Hanover.	**Hanover,**	L. Russell,	8
8012-6 Bryantville.	Albert L. Dame, South Hanson.	**Hanson,**	A. L. Dame,	9
– –	Henry J. Breen,	**Hardwick,**	P. J. Humphrey,	6
46-3,	Benj. J. Priest,	**Harvard,**	G. C. Maynard,	5
Central,	John Condon,	**Harwich,**	Arthur F. Cahoon,	9
6-3,	John M. Strong, West Hatfield.	**Hatfield,**	Seth W. Kingsley,	6
4-2 or 4-1,	John B. Gordon,	**Haverhill,**	M. J. Fitzgerald,	4
12-13,	Melvin H. White, Charlemont.	**Hawley,**	– –	–
5-18,	S. G. Benson,	**Heath,**	– –	–
21305,	Geo. Cushing,	**Hingham,**	T. L. Murphy,	8
– –	Louis B. Brague,	**Hinsdale,**	– –	–
No telephone,	Walter E. Hooker,	**Holbrook,**	F. T. White,	8
42-4,	Winfred H. Stearns, Jefferson.	**Holden,**	W. H. Stearns,	6
5-21,	Oliver L. Howlett, Southbridge, R. F. D.	**Holland,**	A. F. Blodgett,	6
1-2,	W. A. Collins,	**Holliston,**	Herbert E. Jones,	7
2295-W,	C. J. Healey,	**Holyoke,**	– –	–
283-12,	Walter F. Durgin,	**Hopedale,**	W. F. Durgin,	6
Central,	R. I. Frail,	**Hopkinton,**	W. A. MacMillan,	6
6-13,	E. A. Young,	**Hubbardston,**	E. A. Young,	6
207-M,	Wm. L. Wolcott,	**Hudson,**	F. P. Hosmer,	5
248-W,	Smith F. Sturges, Allerton.	**Hull,**	J. Knowles,	8
– –	John J. Kirby,	**Huntington,**	– –	–
– –	Pindar F. Bussell,	**Ipswich,**	J. A. Morey,	3
– –	Arthur B. Holmes,	**Kingston,**	R. F. Randall,	9
261-2,	Nathan F. Washburn,	**Lakeville,**	N. F. Washburn,	9
218-J,	Arthur W. Blood,	**Lancaster,**	L. R. Griswold,	5
717-5, Pittsfield,	King D. Keeler,	**Lanesborough,**	– –	–
362,	Dennis E. Carey,	**Lawrence,**	I. B. Kelly,	4

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
66-3, . . .	Jas. W. Bossidy, . .	**Lee,** . . .	- -	-
37-5, . . .	B. H. Fogwell, . .	**Leicester,** . .	J. H. Woodhead, .	6
135, . . .	O. R. Hutchinson, . .	**Lenox,** . . .	T. Francis Mackey,	6
546 or 28, . .	Fred A. Russell, . .	**Leominster,** .	D. E. Bassett, .	5
9-44, Cooleyville,	O. C. Marvel, North Leverett.	**Leverett,** . .	H. W. Field, .	6
468, . . .	Azor P. Howe, . .	**Lexington,** . .	A. P. Howe, . .	1
284-11, . .	Jacob Sauter, . . .	**Leyden,** . .	Wm. A. Campbell,	6
45-W, . . .	J. J. Kelliher, . .	**Lincoln,** . .	J. J. Kelliher, .	5
17-4, . . .	A. E. Hopkins, . .	**Littleton,** . .	A. E. Hopkins, .	5
1233-2, . .	O. C. Pomeroy, . .	**Longmeadow,** .	- -	-
201-12, . .	E. F. Saunders, . .	**Lowell,** . .	J. H. Gordon, .	4
17-13, . . .	Edward E. Chapman, .	**Ludlow,** . .	- -	-
20, . . .	Jas. S. Gilchrest, . .	**Lunenburg,** .	James S. Gilchrest,	5
1174, . . .	Herbert C. Bayrd, . .	**Lynn,** . . .	G. H. McPhetres, .	2
6-3, Lynnfield Center.	Thos. E. Cox, Wakefield, R. F. D.	**Lynnfield,** . .	L. H. Twiss, .	1
- -	R. W. Noyes, . . .	**Malden,** . .	W. B. Gould, .	1
319-W, . .	Peter A. Sheahan, . .	**Manchester,** .	R. I. Crocker, .	2
1-3 or 1-2, . .	Herbert E. King, . .	**Mansfield,** . .	Marvin J. Hills, .	7
226-W, . .	Wm. H. Stevens, . .	**Marblehead,** .	W. H. Stevens, .	2
117-2, . . .	Geo. B. Nye, . . .	**Marion,** . .	J. Allenack, .	9
416 or 151-M, .	E. C. Minehan, . .	**Marlborough,** .	M. E. Lyons, .	5
43-3, . . .	Wm. G. Ford, . . .	**Marshfield,** . .	P. R. Livermore, .	9
19-11, Cotuit, .	Jos. A. Peters, . . .	**Mashpee,** . .	W. F. Hammond, .	9
52-4, . . .	Chas. W. Ellis, . .	**Mattapoisett,** .	Thos. C. Tinkham,	9
138-3, . . .	Geo. H. Gutteridge, .	**Maynard,** . .	A. Coughlin, .	5
106-4, . . .	Waldo E. Kingsbury, .	**Medfield,** . .	G. L. L. Allen, .	7
53 or 138, . .	Chas. E. Bacon, . .	**Medford,** . .	W. J. Gannon, .	1
No telephone, .	A. Le Barron Treen, West Medway.	**Medway,** . .	F. Hager, . .	7
- -	- -	**Melrose,** . .	J. J. McCullough,	1
156-6, . . .	Frank M. Aldrich, . .	**Mendon,** . .	F. M. Aldrich, .	6
21-3, . . .	Edgar P. Sargent, . .	**Merrimac,** . .	C. R. Ford, .	3
229, . . .	Herbert Nichols, . .	**Methuen,** . .	A. H. Wagland, .	4
36 or 5, . .	Chester E. Weston, . .	**Middleborough,**	A. D. Nelson, .	9
8003-2, . .	Thos. H. Fleming, Bancroft.	**Middlefield,** .	- -	-
No telephone, .	Oscar H. Sheldon, . .	**Middleton,** . .	B. T. McGlauflin,	3
65-3, . . .	Elbert M. Crockett, .	**Milford,** . .	P. F. Fitzgerald, .	6
- -	Harry L. Snelling, . .	**Millbury,** . .	E. F. Roach, .	6
5-2, . . .	Chas. LaCroix, . .	**Millis,** . . .	E. W. Stafford, .	7

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
322,	Nathaniel T. Kidder,	**Milton,**	N. T. Kidder,	8
No telephone,	S. R. Tower,	**Monroe,**	– –	–
12-22,	O. E. Bradway,	**Monson,**	Robert S. Fay,	6
278-15, Greenfield,	Fred T. Lyman,	**Montague,**	Dennis F. Shea,	6
164-4,	D. C. Tryon,	**Monterey,**	– –	–
3-24, Russell,	Andrew J. Hall,	**Montgomery,**	– –	–
17-21 Copoke, N. Y.	G. W. Patterson,	**Mt. Washington,**	– –	–
– –	– –	**Nahant,**	T. Roland,	2
– –	Richard A. Brooks,	**Nantucket,**	C. C. Macy,	9
31 or 244-2,	Bernard E. Darling,	**Natick,**	H. S. Hunnewell,	7
195-1,	Howard H. Upham,	**Needham,**	E. E. Riley,	7
No telephone,	Chas. S. Baker,	**New Ashford,**	– –	–
2280 or 353,	Edward F. Dahill,	**New Bedford,**	C. F. Lawton,	9
6-4,	Frank A. Morse,	**New Braintree,**	E. L. Havens,	6
13-6, Sheffield,	E. M. Stanton, Mill River,	**N. Marlborough,**	– –	–
Pay Station,	Rawson King,	**New Salem,**	R. King,	6
173-5, Newburyport.	Wm. P. Bailey,	**Newbury,**	Percy Oliver,	3
380,	Chas. P. Kelley,	**Newburyport,**	C. P. Kelly,	3
30, N. S.,	W. B. Randlett, Newton Center.	**Newton,**	C. I. Buckman,	1
41-5,	Jas. T. Buckley,	**Norfolk,**	James T. Buckley,	7
205-W or 265,	H. J. Montgomery,	**North Adams,**	Franklin B. Locke,	6
821-W,	Geo. A. Rea,	**North Andover,**	Fred W. Phelan,	4
17-2,	Chas. F. Gehrung,	**N. Attleborough,**	F. P. Toner,	7
26-14,	Geo. O. Rollins,	**N. Brookfield,**	S. D. Colburn,	6
33-3,	Henry Upton,	**North Reading,**	G. E. Eaton,	1
165,	F. E. Chase,	**Northampton,**	Christopher Clarke,	6
14-5,	T. P. Haskell,	**Northborough,**	T. P. Haskell,	6
71-5,	W. E. Burnap, Whitinsville.	**Northbridge,**	A. F. Whitin,	6
2-3,	Fred W. Doane,	**Northfield,**	F. W. Doane,	6
29-11,	Geo. H. Storer,	**Norton,**	G. H. Storer,	7
11-4,	John Whalen,	**Norwell,**	J. H. Sparrell,	8
55-4,	Frank W. Talbot,	**Norwood,**	Ebin F. Gray,	7
119-4,	Frank W. Chase,	**Oak Bluffs,**	P. P. Hurley,	9
17-5,	Chas. H. Trowbridge,	**Oakham,**	C. H. Trowbridge,	6
67-13,	Frank M. Jennison,	**Orange,**	F. M. Jennison,	6
– –	James Boland,	**Orleans,**	A. Smith,	9
15,	Durand A. Witter,	**Otis,**	– –	–
9-5,	Olin D. Vickers,	**Oxford,**	C. G. Larned,	6

List of Forest Wardens and Local Moth Superintendents — *Con.*

Telephone Number.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
53-12 or 53-3,	James Summers,	**Palmer,**	C. H. Keith,	6
- -	Fred L. Durgin,	**Paxton,**	F. L. Durgin,	6
18-3,	M. V. McCarthy,	**Peabody,**	J. F. Callahan,	1
242-4,	Myron N. Allen,	**Pelham,**	- -	-
7-23, Bryantville,	Jos. J. Shepherd,	**Pembroke,**	J. J. MacFarlan,	9
54-3 or 12-5,	Geo. G. Tarbell, East Pepperell.	**Pepperell,**	J. Tune,	4
- -	Walter H. Pike,	**Peru,**	- -	-
13-2,	Geo. P. Marsh,	**Petersham,**	David Broderick,	6
176-6, Athol,	Wm. Cowlbeck, Athol, R. F. D.	**Phillipston,**	W. H. Cowlbeck,	6
149 or 964,	Wm. C. Shepard,	**Pittsfield,**	- -	-
33-22,	Albert F. Dyer,	**Plainfield,**	- -	-
283-J, North Attleborough.	R. P. Rhodes,	**Plainville,**	Ralph Snell,	7
88-W or 197-W,	Herbert Morissey,	**Plymouth,**	A. A. Raymond,	9
11-14,	Thos. W. Blanchard,	**Plympton,**	D. Bricknell,	9
19-4, Highland,	A. W. Doubleday, Greenwich Village.	**Prescott,**	C. M. Pierce,	6
13-4,	Fred W. Bryant,	**Princeton,**	F. A. Skinner,	6
17, Special,	Albert W. Fuller,	**Provincetown,**	J. M. Burch,	9
601 or 1,	A. L. Litchfield,	**Quincy,**	A. J. Stewart,	8
35-4, Randolph,	R. F. Forrest,	**Randolph,**	Chas. Cole,	8
1284-R,	John V. Festing,	**Raynham,**	G. M. Leach,	7
518-W,	H. E. McIntire,	**Reading,**	H. M. Donegan,	1
11-12,	Benj. F. Monroe, Attleborough, R. F. D.	**Rehoboth,**	S. W. Robinson,	7
- -	- -	**Revere,**	G. P. Babson,	1
8-2,	T. B. Salmon,	**Richmond,**	- -	-
No telephone,	Daniel E. Hartley, Mattapoisett, R. F. D.	**Rochester,**	Edw. F. Handy,	9
55-4,	John H. Burke,	**Rockland,**	F. H. Shaw,	8
27-3,	A. J. McFarland,	**Rockport,**	F. A. Babcock,	2
21-6, Charlemont,	Merritt A. Peck, Zoar,	**Rowe,**	- -	-
3-15,	Daniel O'Brien,	**Rowley,**	L. R. Bishop,	3
279-2, Athol,	L. G. Forbes,	**Royalston,**	A. H. Brown,	6
- -	S. S. Shurtleff,	**Russell.**	- -	-
13-3,	Henry Converse,	**Rutland,**	H. E. Wheeler,	6
- -	- -	**Salem,**	Warren P. Hale,	2
- -	Chas. I. Dow,	**Salisbury,**	H. C. Rich,	3
202-14, Winsted, Conn.	Lyman H. Clark, New Boston.	**Sandisfield,**	- -	-
52-14, Sagamore,	John F. Carlton,	**Sandwich,**	B. F. Dennison,	9
115,	Chas. L. Davis,	**Saugus,**	T. E. Berrett,	1
3-3,	Herbert H. Fitzroy,	**Savoy,**	- -	-

List of Forest Wardens and Local Moth Superintendents — *Con.*

Telephone Number.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
98-2, . . .	Henry T. Cole, . .	**Scituate,** . .	P. S. Brown, .	8
399-L-5, Pawtucket.	John L. Baker, Attleborough, R. F. D.	**Seekonk,** . .	C. W. Thompson, .	7
121-2, . . .	A. Alden Carpenter, .	**Sharon,** . .	J. J. Geissler, .	7
24-2, . . .	Arthur H. Tuttle, . .	**Sheffield,** . .	- -	-
130-2, . . .	Chas. S. Dole, Shelburne Falls.	**Shelburne,** . .	- -	-
11-4, Natick, .	Milo F. Campbell, . .	**Sherborn,** . .	J. P. Dowse, .	7
16-21, . . .	A. A. Adams, . . .	**Shirley,** . .	A. A. Adams, .	5
48-3, . . .	Edward A. Logan, . .	**Shrewsbury,** .	C. R. Webb, .	6
2-21, . . .	Fred Aldrich, . . .	**Shutesbury,** .	E. Colfax Johnson,	6
- -	Wm. F. Griffiths, Swansea, R. F. D.	**Somerset,** . .	C. Riley, . .	7
- -	- -	**Somerville,** . .	A. B. Pritchard, .	1
471-W, Holyoke, .	Louis H. Lamb, South Hadley Falls.	**South Hadley,** .	Wm. McLeod, .	6
153-2, . . .	Dana Howland, . .	**Southampton,** .	C. S. Olds, . .	6
13, Marlborough,	Harry Burnett, . .	**Southborough,** .	H. Burnett, . .	6
11, . . .	Aimee Langevin, . .	**Southbridge,** .	A. Langevin, .	6
8-2, . . .	Benj. M. Hastings, . .	**Southwick,** .	- -	-
77-4, . . .	A. F. Howlett, . .	**Spencer,** . .	G. Ramer, . .	6
20, Indian Orchard.	T. J. Clifford, Indian Orchard.	**Springfield,** .	W. F. Gale, . .	6
5-12, . . .	Joel T. Wilder, . .	**Sterling,** . .	J. H. Kilburn, .	5
Post Office, . .	Geo. Schneyer, Glendale,	**Stockbridge,** .	Brown Caldwell, .	6
207-R or 127-M, .	Louis F. Bruce, . .	**Stoneham,** . .	G. M. Jefts, . .	1
121-3 or 8120, .	James Curley, . . .	**Stoughton,** .	W. P. Kennedy, .	8
134-J, Hudson, .	W. H. Parker, Gleasondale.	**Stow,** . . .	G. A. Patterson, .	5
6-21, . . .	Chas. M. Clark, Fiskdale,	**Sturbridge,** . .	C. M. Clark, .	6
5-5, . . .	S. W. Hall, South Sudbury.	**Sudbury,** . .	W. E. Baldwin, .	5
46, . . .	A. C. Warner, . . .	**Sunderland,** .	Richard Graves, .	6
49-16, Millbury, .	R. H. Richardson, . .	**Sutton,** . .	Ransom H. Richardson.	6
3806 or 82, . .	Geo. P. Cahoon, . .	**Swampscott,** .	E. P. Mudge, .	2
468-W, . .	Thos. L. Mason, . .	**Swansea,** . .	A. E. Arnold, .	7
320 or 1-3, . .	Fred A. Leonard, . .	**Taunton,** . .	L. W. Hodgkins, .	7
23-3, . . .	A. R. Paine, Baldwinsville.	**Templeton,** .	J. B. Wheeler, .	6
12-2, . . .	Harris M. Briggs, . .	**Tewksbury,** .	H. M. Briggs, .	4
161-4 or 102-3, .	Elmer C. Chadwick, Vineyard Haven.	**Tisbury,** . .	H. W. McLellan, .	9
No telephone, .	Clayton H. Deming, .	**Tolland,** . .	- -	-
Central, . .	Chas. W. Floyd, . .	**Topsfield,** . .	C. W. Floyd, .	3
11-2 or 37-2, .	F. J. Piper, . . .	**Townsend,** . .	G. E. King, . .	4
- -	Walter F. Rich, . .	**Truro,** . . .	J. H. Atwood, .	9
1, . . .	Otis L. Wright, . .	**Tyngsborough,** .	C. J. Allgrove, .	4

List of Forest Wardens and Local Moth Superintendents — *Con.*

Telephone Number.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
1-2, Lee,	H. E. Moore,	**Tyringham,**	- -	-
7-2,	E. M. Baker, Upton Center.	**Upton,**	G. H. Evans,	6
51-5,	Lewis F. Rawson,	**Uxbridge,**	Willard Holbrook,	6
455-M or 58,	Wm. E. Cade,	**Wakefield,**	W. W. Whittredge,	1
No telephone,	Warren W. Eager,	**Wales,**	M. C. Royce,	6
43-11,	J. J. Hennessy,	**Walpole,**	P. R. Allen,	7
6,	Geo. L. Johnson,	**Waltham,**	W. M. Ryan,	1
5-13,	Louis A. Charbonneau,	**Ware,**	F. Zeissig,	6
45-23,	Delbert C. Keyes, South Wareham.	**Wareham,**	J. J. Walsh,	9
46-6,	Jos. D. Vigneaux, West Warren.	**Warren,**	A. A. Warriner,	6
73-3, Orange,	Chas. A. Williams,	**Warwick,**	Chas. E. Stone,	6
12-4,	Lester Heath,	**Washington,**	- -	-
116, Newton North.	John C. Ford,	**Watertown,**	J. C. Ford,	1
-	William Stearns,	**Wayland,**	D. J. Graham,	5
113-4,	Timothy Toomey,	**Webster,**	C. Klebart,	6
172-W,	Wm. W. Diehl, Wellesley Hills.	**Wellesley,**	F. M. Abbott,	7
- -	John Holbrook,	**Wellfleet,**	E. S. Jacobs,	9
74-41, Orange,	Harry J. McCoy, Wendell Depot.	**Wendell,**	G. E. Mills,	6
74-2,	Jacob D. Barnes,	**Wenham,**	J. D. Barnes,	2
3-21,	Fred E. Clark,	**West Boylston,**	C. H. Baldwin,	6
768, Brockton,	W. P. Laughton,	**W. Bridgewater,**	O. Belmore,	8
37-13,	J. H. Webb,	**W. Brookfield,**	J. H. Webb,	6
5-6,	Louis H. Flook,	**W. Newbury,**	Frank D. Bailey,	3
2067-1,	Dana S. Moore,	**W. Springfield,**	Geo. W. Hayden,	6
- -	Geo. B. Latour,	**W. Stockbridge,**	- -	-
203-23,	Wm. J. Rotch,	**West Tisbury,**	H. W. Athearn,	9
75-3,	Thos. H. Treadway,	**Westborough,**	Geo. Hayden,	6
111-Y,	T. H. Mahoney,	**Westfield,**	- -	-
- -	Harry L. Nesmith,	**Westford,**	H. L. Nesmith,	4
148-14,	C. A. Bartlett, Northampton, Stage.	**Westhampton,**	- -	-
29-4,	W. H. Waterhouse,	**Westminster,**	G. A. Sargent,	6
1392-M,	Benj. R. Parker,	**Weston,**	E. P. Ripley,	5
No telephone,	Herbert A. Sanford,	**Westport,**	H. A. Sanford,	9
- -	Elmer E. Smith, Islington,	**Westwood,**	C. H. Southerland,	7
154-W,	Edgar S. Wright,	**Weymouth,**	C. L. Merritt,	8
69-2, South Deerfield.	James A. Wood,	**Whately,**	- -	-
104-14,	C. A. Randall,	**Whitman,**	C. A. Randall,	8
1-4,	Henry I. Edson,	**Wilbraham,**	F. B. Metcalf,	6

List of Forest Wardens and Local Moth Superintendents — *Con.*

Telephone Number.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
46-2,	J. Edward Pierpont,	**Williamsburg,**	- -	-
34-14,	William Davies,	**Williamstown,**	Wm. Davies,	6
34-4,	Howard M. Horton,	**Wilmington,**	O. McGrane,	1
29,	Arlon D. Bailey,	**Winchendon,**	G. W. Drury,	6
123-2,	David H. DeCourcy,	**Winchester,**	S. S. Symmes,	1
201-12, Dalton,	Amos Ferry,	**Windsor,**	- -	-
- -	- -	**Winthrop,**	W. A. Whittemore,	2
110,	Frank E. Tracy,	**Woburn,**	J. H. Kelley,	1
7112, Park,	Arthur V. Parker,	**Worcester,**	H. J. Neale,	6
10-22,	Chas. Kilbourn,	**Worthington,**	- -	-
- -	Geo. H. E. Mayshaw,	**Wrentham,**	W. Gilmore,	7
53-33,	Jos. W. Hamblin,	**Yarmouth,**	C. R. Bassett,	9

WINCHENDON SHOWING MUCH INTEREST IN FORESTRY.

One of the first towns in the State to co-operate with this department was the town of Winchendon. Practical undertakings were begun by some of the farsighted and stable business men of the town, and these have been splendid object lessons. The late Mr. John Folsom, who had been the official in charge of the town trees for years, spent his last days in interesting his townsmen in reforestation and in practicing modern forestry. Winchendon village is a beautiful New England hamlet nestling in a valley of the town, which borders the New Hampshire line, and at an elevation of over 1,000 feet. The chief industries of the town are those requiring quantities of forest products, particularly white pine. Winchendon is noted for its productions of wooden pails, tubs, toys, ice-cream freezers and a variety of manufactured wooden products. The numerous factories here established are dependent for their future raw material upon the forests. The country about Winchendon is ideally adapted for forestry, and offers an exceptional opportunity to demonstrate how valuable an asset modern forestry can be made to a Massachusetts or New England town. In a natural forest country, like that found in rural sections of this State, there are great possibilities for our people to gain a

A view from the lookout station on Robbins Hill, Chelmsford, looking toward Boston. Note the amount of forest country.

A forest nursery in the town of Neustadt, Ger. Were some of our rural towns to start such an enterprise in connection with the office of forest warden, tree warden and moth superintendent, it could be made a valuable auxiliary toward establishing town forests.

splendid and permanent livelihood, were we to develop similar industries for using and manufacturing home-grown forest products, as Winchendon is doing. This type of environment also builds up and engenders a healthful and happy people.

The moth scourge is just beginning to make some inroads in Winchendon, but it is believed that it will never amount to anything here, as the town immediately purchased up-to-date equipment, and will not allow the moths to trespass. At a recent meeting at which the State Forester gave an illustrated talk, showing slides comparing conditions in Massachusetts with the Black Forest of Germany, he emphasized how the town of Winchendon might be made the Black Forest town of New England, and the idea seemed to meet the general approval of both officials and citizens.

The town set out 10 acres to white pine last year as a start toward a municipal forest, and plans are already made for setting a much larger area next spring, and the acquisition of more territory. The Murdock Company, the Brown Brothers, the Converse Company and various individuals have already set out several hundred acres in this and adjoining towns. The Brown Brothers have about 1,000,000 two-year-old seedlings in their nursery at the present time, and Mr. Elisha Whitney, the president of the Murdock Company, has purchased for next spring's delivery a very large consignment. The accompanying photograph (see frontispiece) was taken by the writer of one of the Murdock Company's four-year Scotch pine plantations in the town of Ashburnham.

The true forestry spirit is to be found in Winchendon, and it is hoped that other rural towns may emulate this example. See, also, the Winchendon forest fire auto truck, a photograph of which is to be found in this report.

Forestry Practices as a Key to Moth Control.

This year for the first time an organized attempt has been made to apply forestry to the moth problem. Work along this line has been done for several years, notably on the North Shore, but the immediate purpose of most of the thinnings made was to facilitate spraying and creosoting rather than to eradicate the favorable moth food. This year a special department was inaugurated to carry on this work under a trained forester.

The various means of controlling the moths may be classified under three heads, — direct entomological methods, indirect entomological methods and forestry methods. The direct entomological methods seek the destruction of the moths in one of their various forms by human agency, as in spraying or creosoting. The indirect methods seek the propagation of parasites or disease which will destroy the moths. The forestry methods seek the encouragement of tree growth which is unfavorable to the moths.

It has been found, from our own and from European observations and experiments, that although it will eat practically all kinds of vegetation, the gypsy moth thrives only on a limited number of species of trees. These trees, which are the oaks (especially the white oak), willow, fruit and cherry trees, and probably the gray birch, may be called "non-resistant" trees. Unless a large proportion of their food consists of the leaves of these "non-resistant" trees, under ordinary conditions the moths will soon pass on to a more favorable feeding ground or die. Therefore forestry methods, rather than attempting to destroy the moths themselves, would destroy their food. If we grow forests of resistant species, as conifers, maple, chestnut, ash, etc., the moths will cease to be destructive.

To shade trees and to ornamental or park woodland, where hardly a tree can be spared, these forestry methods do not apply very extensively, but in wild woodland spraying is too expensive and other methods are costly or inefficient, and we must rely on parasites, disease and resistant forest conditions if we are to control the moths. This is the way they are controlled in Europe, where they have existed from time immemorial, and this is the way we must eventually control them in this country. It is a vast work, the changing the forest conditions of this State, but if we can change the poor oak forests into pine forests, for which most of the land is naturally suited, the gypsy moth will turn out a blessing in disguise.

The white oak seems a doomed tree in the moth-infested region. Weakened by moth attacks, the "agrilus," or chestnut borer, finds an easy entrance and soon kills it. The other oaks seem a little more resistant to both the moths and the borer, but except in very favorable soil it would not seem advisable to attempt to grow them unless they can be well taken care of by spraying. If oak is grown it should be kept in pure stands, for if grown in mixture, as with pine, both the oak and pine will be attacked. One owner of a very fine stand, consisting mostly of large white oaks, desired very much to save them. They were badly infested, and he spent large sums of money in spraying and creosoting them for several years. On account of the height of the trees, and the difficulty in always getting them sprayed thoroughly, they were eaten enough so that the borers found entrance, and this year it has been necessary for him to cut them all off after a large part of the stand had died. This shows the difficulty in saving white oak.

The primary purpose of moth thinnings is to remove from a stand non-resistant trees, and to leave and encourage the growth and reproduction of the resistant species. The secondary purposes are to aid in taking care of the stand by other and more direct methods of moth control; to increase the æsthetic value of the stand; to decrease the fire danger; to salvage the dead and dying trees; and increase the growth and health of the remaining trees by giving them more light and room. A moth thinning will not be efficient in checking the moths without the aid of spraying, unless practically all the non-resistant trees are removed and kept out. In a stand of pure oak, for instance, it will be necessary to cut clear and replant with resistant trees. In a stand which is 50 per cent or more resistant, and the rest oak, the removal of all the oaks would still leave the ground fairly well shaded, and no replanting or spraying would be necessary. Owners should realize that it is foolish, year after year, to creosote and spray a grove of trees which is mostly resistant, when if they would only cut out the non-resistant trees and brush no other care would be necessary. This thing has been observed in a number of cases and persisted in, even after emphatic advice to the contrary. An interesting case was noted in Cohasset this year. There was a small area of large mixed hard woods surrounded by a growth of similar character. About half the trees were oak and about half were of resistant species, as ash, hickory and maple. The moth infestation was very heavy, and when the area was examined in the early spring there were several hundred gypsy moth egg clusters on each tree. The owner did not want to spray, and he was advised to cut down all the oaks and await results. He did this, leaving only a very few oaks. He neither painted nor sprayed, nor did any of the surrounding owners. In July, when the moth eating was about completed, the area was again examined. The results surprised even the one who had advised this treatment. Whereas in the surrounding area there was almost a complete defoliation of all species, on the thinned tract practically all the leaves were intact, with the exception of those on the oaks that were not cut out. Of course this case may be exceptional, yet we believe it reveals the possibilities of resistant thinnings.

In the many areas of woodland where, on account of the large proportion of oak and the æsthetic value of the woods, a totally resistant thinning is impractical, moth thinnings are of great value as an aid to spraying. In fact, it is almost impossible to spray woodland effectively unless a certain amount of thinning has been done. The thinning makes the work more effective and lessens the cost from 25 to 60 per cent. In one area that a year ago was sprayed, unthinned, at a cost of nearly $10 per acre, and even then was partly defoliated, this year, after thinning and brush-cutting, was sprayed at a cost of a little more than $4 per acre, and practically no stripping occurred. The cost of thinning, including cutting and burning the brush, was about $5 per acre, deducting the value of the wood cut. From this it is evident that in one year this thinning was a paying proposition to the owner. In thinning that is to be followed by spraying, and wherein the element of looks enters considerably, it is necessary to do much more cutting and disposing of brush than in straight, resistant thinnings. The care of the brush is one of the large factors of expense in this work. In purely resistant thinnings it is only necessary to cut the non-resistant brush, as scrub oak, witch-hazel and gray birch.

A good method of handling a stand that has a very high percentage of oak growth is to make a heavy thinning, cutting

A neglected and badly moth-infested woodland. The growth here is not large enough to pay for thinning, and contains quantities of dead trees, which condition is one of the worst to deal with. About all that can be done is to cut it clean and replant. There are many acres of this type and they are most discouraging propositions to the owners. Starvation methods may be practiced under favorable circumstances.

A woodland thinning to assist in controlling the gypsy moth. The favorite food trees are removed. The white pine is encouraged. A process of building over the forest. A thinned forest like this can be sprayed and looked after at far less expense. The forest products removed pay for the treatment. One hundred acres on the Weld estate, Dedham.

all white oaks if possible, and to follow this with underplanting of pine. Within ten years or so the rest of the oaks can be removed and a pine stand will result. This is not practicable, however, unless the area can be sprayed if necessary in the meantime. In many places examined there was considerable natural pine reproduction, and a thinning would aid very much in bringing it along. In other places, where the woodland is desired for landscape effect, as along roads or bordering fields, and where the growth is largely non-resistant, and spraying impractical over the whole area, then a strip can be left along the edge, but a clean cutting made in the interior followed by natural resistant reproduction, if possible, or planting. The outside strip can be cared for, and the interior will eventually sustain a moth-resistant growth, while the effect will not be injured.

Although we have not had sufficient experience as yet in this thinning work to show many results or make absolute conclusions, there are a few opinions which we have arrived at and which may be of interest to owners of infested woodland. They are as follows: —

1. Moth thinnings are constructive. The owner who uses direct methods of moth control must expect to keep them up year after year without any sure relief. By growing a resistant forest he is making the moth problem solve itself.

2. Moth thinnings are advantageous to the owners of park or ornamental woodland or land awaiting development. The main factor in land of this type is that the wooded character of the area be maintained and at the least possible expense. Thinnings will improve the general condition and attractiveness of the area and will make it much easier and cheaper to take care of in the future.

3. Moth thinnings are advantageous to the owners of woodland which is chiefly valuable for the wood it produces, provided the growth is of merchantable size. Woodland of this type cannot be annually sprayed because it is not worth it. If the owner leaves it alone, eventually most of the non-resistant trees, and many of the resistant species, will be killed and the stand greatly depreciate in value. A thinning of the non-resistant trees in woodland of fair to good quality will pay for

itself at least, and will leave a more valuable stand than if it had been left alone. It is also easier to cut live trees than dead ones.

4. Moth thinnings are advantageous to the owners of poor or sprout growth, where there is a considerable proportion of young pine present. The wood will not pay for the work, but the development of pine will. If left alone, especially where the growth is gray birch mixed with pine, the moths will practically destroy the whole value of the growth, which if properly conserved would prove to be considerable.

5. Moth thinnings are cheaper and more effective if undertaken before the moth infestation becomes serious than if made afterwards.

Considerable cost data have been collected from the thinning operations carried out under the direction of this department, but not enough to give any certain figures as yet. The main factors in the cost are the efficiency of the labor, the size and thickness of the growth, the severity of the thinning, the amount and method of brush-cutting and disposal, and the utilization and market of the product. In general terms it may be said that a thinning which will yield 7 or 8 cords to the acre will pay for itself, allowing for the burning of the slashing, provided that there is not an unusual amount of brush to be cut, and that ordinary labor and market conditions prevail. The cost mounts rapidly if large quantities of brush are to be cut. The cheapest way of doing work is by the cord, under good supervision, or an experienced crew working by the day may do as well. The profits may be considerable if there are many ties, poles or piles to be cut.

Work accomplished this Year.

Since this work was organized a gratifying amount of interest has been shown in thinning work. The work carried on has not been primarily experimental in character, but rather educational and practical. The United States Bureau of Entomology, in connection with the Forest Service, is now carrying on experiments in moth thinnings under Mr. Clement, from which we anticipate some very practical data.

On account of the obvious necessity of getting this work started as rapidly as possible, we did not await the usual course of events and have the owners come in to us for advice and assistance, but rather went out after the owners and proffered our services. With the aid of the district and local moth superintendents a list was made of the owners of the infested woodland of the State, and to each owner was sent a letter offering our advice and help, and enclosing a blank to be signed if an examination of the property was desired. Over 2,000 such letters were sent out, and about 340 have returned the signed examination application to date. Up to December 1 we have been able to make 174 of these examinations, covering an area of about 9,628 acres. About 25 owners up to the present time have started this work, either under our supervision or with our assistance, and by these operations about 1,000 acres will have been put into condition. This does not include the thinnings done by the local or district moth superintendents, which will cover a large aggregate area.

In many towns all the roadsides and considerable private property have been thinned out by the local men, and in the town of Dover and on the North Shore considerable work has been done under special funds.

The aid offered to owners of infested woodland, outside of free advice, has been the marking of trees, the marketing of the wood, the furnishing of labor, and the actual supervision and management of the thinnings. In several cases we have found contractors who would cut the wood under our specifications and inspection and pay the owner for it. We have now three trained crews who will do the work under our direction for any owner who desires them, and will pay the actual cost. We have in other places furnished woodchoppers who cut by the cord under the supervision of a trained foreman. We expect to start out several new crews shortly.

A list of the areas cut or being cut under our direction and supervision follows: —

Town.	Owner.	Area (Acres).
Dover,	Geo. D. Hall,	27
Millis,	A. H. Wheeler,	12
Dedham,	Stephen M. Weld,	70
Dedham,	Mrs. J. C. Fairchild,	6
Westwood,	C. J. Lennon,	3
Norwood,	Edw. Cunningham,	20
Dedham,	Karlstein estate,	83
West Barnstable,	Howard Marston,	60
Norwell,	Nathan Cushing heirs,	15
North Andover,	Miss C. A. French,	45
Cohasset,	Mrs. Sarah Wheelwright,	20
Dedham,	Mrs. Harriet Rodman,	80

Cost. — In the above list seven of the operations will have been carried on at no loss or a small profit, and all but two at a net cost not greatly exceeding $5 an acre. The other two contained so much brush that the cost was larger, but the owners felt well repaid.

Some cost data from the operation on Karlstein estate in Dedham follow. This operation is not quite finished at this writing, so the data are not absolutely complete. The work was done by a crew paid from $2 to $2.25 per day, under an experienced foreman. The men live in a camp provided on the estate. The conditions on the estate were as follows: the growth was mostly a medium hardwood stand, with about 75 per cent oak and about 35 per cent white oak, and with considerable pine reproduction in places. The moth infestation was severe, although as yet not more than 10 per cent of the trees had been killed. The brush was not very heavy, but a fair amount had to be cut. The estate was being held for development, and the purpose of the thinning was to put it into shape so that a wooded condition could be maintained at the least possible expense. The general rule of the cutting was to cut practically all white oaks, all dead and inferior trees, and as many of all species of the other oaks as possible; to cut all brush necessary, to split and pile the wood in 4-foot lengths; to burn the brush and slashing, and to encourage the growth of the pine as much as possible.

A mixed growth of hard and soft wood that is sure to be destroyed by the gypsy moth unless the owner spends large sums of money in spraying and treating. The only practical forestry solution is to immediately cut out the hardwoods and give the whole area over to the white pine. In an infested stand like this the pines are killed outright in a year or two; therefore, owners having similar woodlands should give them early attention. The pine in clear stands by itself is perfectly resistant to the moths.

A severe thinning, to be followed by underplanting with white pine. The product, which was largely white oak, sold for enough to meet the expense. Gypsy moth suppression work on the Karlstein property at Dedham. This property was stripped the past season.

Cost Data of Operation on Karlstein Estate.

Cutting and piling, based on 82.5 acres; burning, based on 47.5 acres. Total cut: 559 cords of wood, 90 ties, 6,000 feet of pine. In working data this is called the equivalent of 565 cords.

	Per Cord.	Per Acre.	Total.
Wood and brush cutting,[1]	$1 97	$13 48	$1,112 05
Brush piling,	15	1 00	83 00
Brush burning,	25	1 80	148 10[2]
Other expense,[3]	04	25	21 00
Supervision,[4]	15	1 01	84 00
Total,	$2 56	$17 55	$1,448 15[2]

[1] Includes stacking wood. Brush cutting is estimated at about 8 per cent.

[2] Estimated.

[3] Includes saw filing, scaling wood, etc.

[4] Includes time spent by foreman in directing men and marking trees, when he was not actually engaged in productive work.

Other items of expense which are not included are the cost of a camp for the men and of tools which will not greatly exceed $25 in this case.

In conclusion we would say that this department is anxious to get in touch with all the owners of infested woodland in the State, to give them advice and all the help possible in solving the woodland problem. This work cannot be carried on without the help of the owners, who are the parties most vitally affected.

Forest Mapping.

This summer a beginning was made in work we have long desired to attempt, namely, the making of an estimate of the acreage of forest of different types and sizes; and, in conjunction with this, work out a forest map on which is shown, so far as practicable, what the land is producing.

It is possible to hire, in the summer, forest school students who are cheap and efficient men for this purpose. The work was carried out under the direction of Mr. Harold Fay, one of the assistant foresters in the office, who had the assistance of four forestry students, picked men from as many forestry schools.

As it was not possible, with the means at hand, to cover the entire State in one season, it was decided to attempt the work county by county, and this year Worcester County was chosen. This county has been covered, with the exception of a few towns.

The method of field work was an adaptation of a large-scale timber cruising system, which we felt gave a maximum amount of information for a minimum cost. Each man worked one town at a time alone, running lines one-half mile apart, by compass and pace, from one boundary to the other. Record was kept of the length of each type, and type boundaries were sketched, so far as practicable, in an especially arranged note book checked off in scale with the large maps, to which the data were easily transferred. These maps, the scale of which is 976 feet to 1 inch, are enlargements from the United States topographical sheets, and we hope will be the basis for permanent forest maps of each town in the State.

By means of symbols the rough proportion of different species of trees growing on the ground traversed is shown, and by numbers, their approximate size. A rough estimate of the percentage of stocking was made. The number of white pine per acre was estimated, to enable a more accurate estimate of this, the most valuable timber, and especially to give an idea of the acreage where the occurrence of scattered white pine gives a chance for converting inferior hardwood forests into pine, by so handling as to secure more pine reproduction. Areas of exceptional hazard for forest fires were located by symbols on the maps, as were wood lots infected in different degrees by the chestnut bark disease.

From this work we feel we shall have a very reliable estimate of the acreage of different types of forests of different age classes for the county as a whole, and a fairly reliable estimate so far as the unit towns are concerned. The completeness and accuracy of the maps depend largely upon whether the towns have much or little open land, and uniform or frequently changing forest types.

So far as we know no other State has begun to collect data which will allow so accurate an estimate of its present stand of timber, and of what is likely to be produced during future periods.

In addition to the maps, which also furnish the basis for acreage and timber estimates, a forest report was made for each town, giving a general account of the forest conditions, lumbering and woodworking industries, prevailing prices of timber and of unproductive land, the names of some of the principal landowners, forest-fire conditions, and the extent of the chestnut bark disease.

The plan is to keep these maps and reports on file at the office, so that forest data will be available for reference whenever a private individual or the department contemplates forestry work in any town.

As a sample we reproduce herewith the map of Bolton, which town was worked by Mr. J. R. Simmons, together with his forest report on the town, and a summary of the acreage estimates compiled from the map.

In forest description of tracts shown on the map, the letters and symbols at the left represent "type;" these are followed by "size-class" figures, then the number of white pine trees per acre (a line drawn above the figures indicates when they are suppressed white pine reproduction). Following the white pine figures comes the estimated percentage of stocking, and last, symbols representing fire hazard, chestnut bark disease, etc., if there chance to be any.

Symbols showing occupation of the soil are arranged in the order of prominence of the type or species. Softwoods when equalling 10 per cent or more of the stand, and hardwoods when equalling 20 per cent or more, are shown if not more than three symbols representing occupation of the soil are used in all.

For key to symbols on the map, see the first two columns of acreage estimate table.

FOREST SURVEY ACREAGE ESTIMATES, TOWN OF BOLTON, MASS., NOVEMBER, 1913.

TYPE SYMBOL.	Size Class,	4, 4–3	3–4, 3	3–2, 2–3	2, 2–1	1–2, 1	Totals (Acres).
	Approximate Age, based on White Pine and Chestnut (Years),	1–12	13–25	26–40	41–60	61 plus	
	Species.						
A,	White pine,	20	424	166	347	14	971
T,	White pine and gray birch,	100	188	–	–	–	288
B,	Mixed hardwood and white pine.	–	161	50	28	44	283
λ,	Mixed softwood,	–	11	2	9	–	22
C,	Chestnut,	–	128	527	383	55	1,093
D and E C,	Chestnut with oaks,	424	887	255	230	–	1,796
S,	Gray birch,	44	112	–	–	–	156
E,	Oaks,	150	419	155	153	–	877
F,	Mixed hardwood,[1]	–	185	–	2	–	187
M,	Red maple,	88	244	–	–	–	332
G,	Maple swamp,	–	424	164	–	–	588
I,	Pitch pine,	–	101	33	–	–	134
	TOTAL WOODLAND AREA,	826	3,284	1,352	1,152	113	6,727[2]

		Acres.
Total woodland area,		6,727
X — Agricultural,	4,373	
O — Open pasture,	902	
K — Brushy pasture,	211	
V — Useless swamp,	94	
Water,	30	
		5,610[3]
Total area of town,		12,337[4]

⊗ — Chestnut blight.	
▽ — Fire hazard,	572[5]
P — Drainable swamp,	94
Scattered pine untyped,	1,143
Suppressed pine, reproduction,	1,154
Total acreage with white pine present,	3,861[6]

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[1] In this table species growing in mixture have been proportioned and recorded in their own column as though of pure growth.

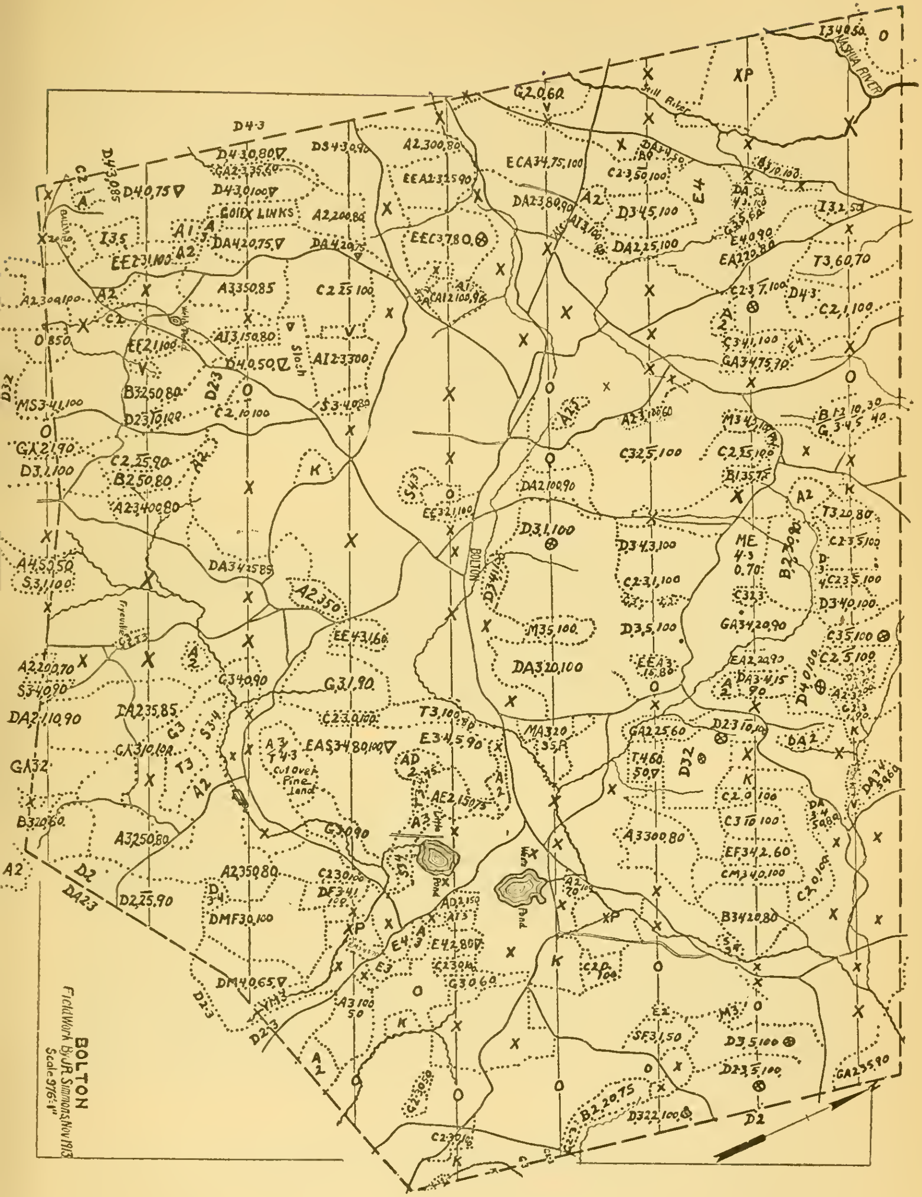
[2] 55 per cent of town area.

[3] 45 per cent of town area.

[4] Total acreage of town was figured from map on page 345.

[5] 5 per cent of town area.

[6] 31 per cent of town area; 57 per cent of woodland area.


BOLTON
Field Work By J.R. Simmons Nov 1913
Scale 976':1"
Nashua River
Still River
Golf Links
Cut over Pine land
Pond
BOLTON
T3 40.50
G2.0.60
ECA3 4.75.100
EEC3 7.8 0
D3 4.5 100
DA2 25 100
T3 60.70
D3.1.100
DA3 20.100
M3 5.100
A3 300.80
D3 5.100
D2 3 5.100
GA2 5.90
DMF3 0.100
DM4 0.65
A2 350
EAS3 4 80.100
G3 1.90
E4 2 80

FOREST REPORT OF TOWN OF BOLTON.

BOLTON, MASS., November, 1913.

Bolton lies along the eastern border of Worcester County just northeast from the city of Clinton. The Boston & Maine Railroad cuts it at the southeastern and southwestern corners, and its best markets, outside of Clinton and Hudson, are Worcester, 15 miles, and Boston, 30 miles, distant. The chief industries are dairy and fruit farming. The town is essentially a farming community, there being but three small villages. The lack of trolley lines is compensated by good roads leading from the town to its markets.

Topography.

The topography is irregular with hills and valleys. The general trend is north and south, with the ridges frequently broken by brooks and gullies. Highest hills are 600 feet.

Soils.

Light sandy soil, generally fertile and fairly deep, having gravel, and some clay subsoil. Black soil in the swamps and on some farms where draining has been done. South of Bolton village, on the west side of the Berlin road, are about 75 acres of moist land, difficult of drainage but bearing good hay. Some parts of the maple swamp on the opposite side of the road could be cleared and drained for agriculture. On the hills the soil is good, quite free from rocks, and raises apples and peaches.

Woodland.

Proportion of wooded to cleared land one-third to two-thirds,[1] according to the report of the assessors to the commission on taxation of waste and forest lands. The general appearance of the country would make this estimate seem too low for forest land. A considerable amount of good high land has been recently cleared of birch and sprouts for fruit growing.

General condition of forest, good, especially in the pine, oak and hardwood types. There is a good layer of humus. Principal species are pine, chestnut and oak, in clear and mixed stands; ash and hickory are common in the mixture, and as roadside trees. Suppressed pine is common in the chestnut and oak types.

LUMBER AND WOODWORKING INDUSTRIES.

Saw Mills.

1. Century Mill, W. J. Webber, proprietor, Bolton, Mass., cuts chestnut and pine; 150 M during the last two years, mostly for box boards which are sent to Hudson, Mass. Stumpage, $10 to $14 per M. Box

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[1] See figures in table compiled from map.

boards, F. O. B., Hudson, $22. This is the only lumber mill in Bolton, and it is idle most of the time.

2. E. M. Walcott, Bolton Village, Mass., cuts about 200 cords of wood per year.

Land Owners.

The largest holdings are considerably under 200 acres, and very little land is for sale. Owners of over 60 acres are checked in the accompanying assessors' list.

Waste Land.

Not extensive in area. Confined to (*a*) a few acres along the Lancaster boundary, in swamp, burned oak and hard pine land; (*b*) a strip of old pasture in the northeast about three-quarters of a mile wide, some of which is brushy; and (*c*) a very small burned area along the Hudson boundary. Average price of waste land $5 per acre.

The only person reported as having waste land for sale is Mr. Blanchard, of Blanchard & Gould; he is said to own two lots of 50 acres each, adjoining.

Fires and Fire Damage.

No recent fires reported, though some slash areas exist, offering considerable risk, located (*a*) along Bolton and Lancaster boundary, north of Bolton station on cut-over lands and sprout growth; and (*b*) some portions of the ridge southwest from Vaughn Hill in the northwest.

A small burn occurred three to five years ago near the Hudson road in the eastern corner of the town, and southeast from Long Hill, and entered some distance into a large chestnut and maple wood lot. The whole burn covered about 50 acres of sprout.

Chestnut Bark Disease.

The chestnut blight occurs in all parts of the town, the worst being in the western and northern portions. A very large area of chestnut north of the village appears, as yet, to be in fair condition, with probably not more than one infected tree to the acre. Some of the wood lot owners interviewed have made a practice of cutting for cordwood blighted trees only, and expressed the opinion that this scheme would probably become popular among owners of timber in Bolton.

REFORESTATION WORK.

The reforestation act passed in 1908 makes provision for any one owning waste land suitable for replanting to deed it over to the State, with the provision that the owner, his heirs or assignees may redeem it at any time within ten years by paying the actual cost of planting. This cost varies from $7 to $10 per acre, according to the size of the tract, accessibility and age of stock used. There is also a section of the act which enables us to buy land at not over $5 an acre, and not over 80 acres in one tract in any one year.

Under this act some 4,489 acres have been acquired, as the following list shows. Of these, about 1,000 acres are owned by the State outright with no redemption clause, the land having been bought at a price of from $2.50 to $5 per acre. Where land has been bought, it is the policy of the office to purchase adjoining land the following year in order that individual lots may be more readily handled. We have advocated the removal of the 80-acre limit, as the average cost of planting is much less on large lots, and it is also often cheaper to acquire a large lot than a number of small ones.

These tracts will increase much in demonstration value in the next few years, as it takes a plantation from five to ten years to reach a height where it will attract attention. Even now some of the older plantations set in 1909 have created an interest in forest planting.

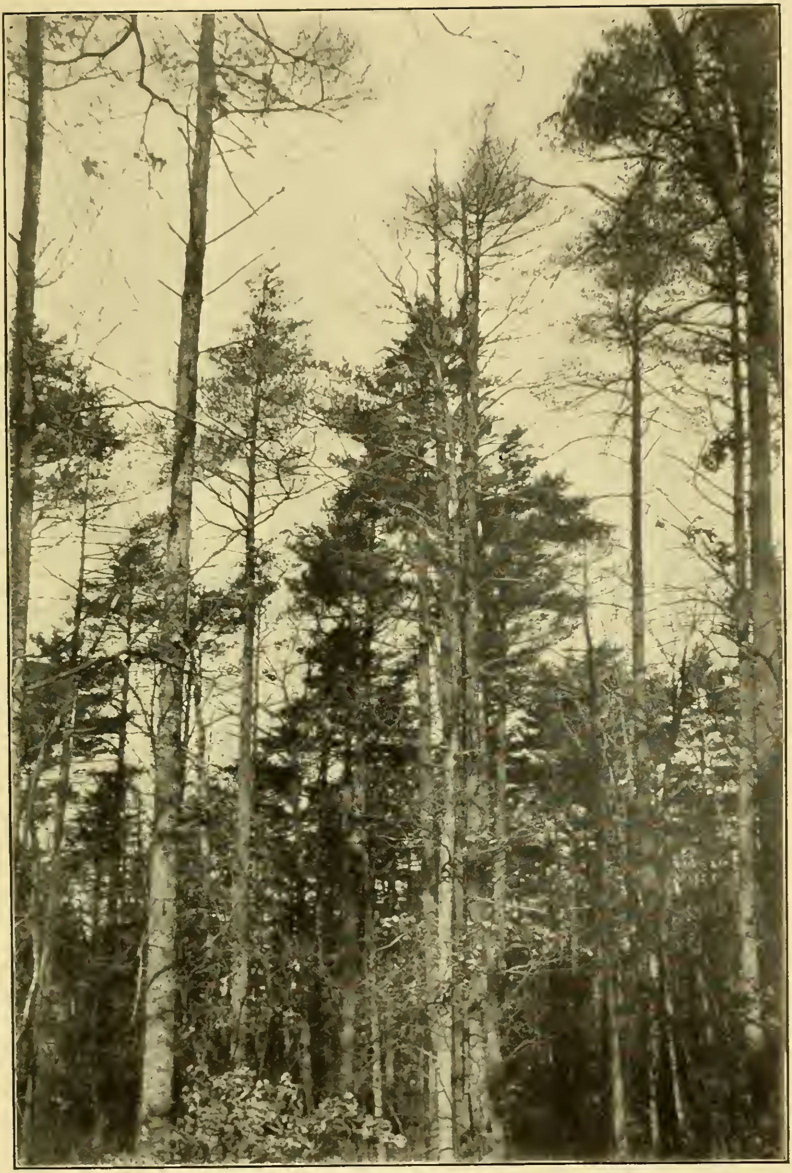
This law seems to be meeting with the aims of those who first advocated it, as throughout the State there are many landowners who would not sell their land outright or would not set it out themselves, but who are willing to have the work done by the State Forester. It is safe to say that not over 200 acres of the 5,000 and over would be restocked to-day had it not been for this act enabling the owners to turn their land over to the State to be planted.

This year we have planted 782 acres of land, while the work of filling in and replanting lots where loss was due to the last few years' drought has been pushed with vigor. During the winter months a number of old lots were cleared of brush which had grown up and was interfering with the trees set.

Forest Nursery.

This fall, on land of the State Farm at Bridgewater, which was prepared for a nursery, we transplanted over 500,000 two-year old seedlings, consisting of white pine, Scotch pine and white ash.

The work was done by inmates of the farm under direction of a foreman employed by this office. By using the farm labor



A splendid stand of large white pine with a relatively small mixture of hardwoods on the fine Rodman estate in Dedham. The pine tops show the ravages of the gypsy moth. A number of the large pines are past redemption. This whole estate is being thinned out at the present time. The hardwoods are being taken out, together with the dead pines. Had the hardwood been removed early all of the pines could have been saved.

in the nursery we shall be able to do much more transplanting than formerly. The State Farm officials, Superintendent Blackstone and Mr. Hunt, have aided us in every way possible, and another spring will have additional land cleared, so that we shall have about 10 acres in the nursery, and be able to do a large amount of spring transplanting, and also raise not only enough transplanted stock to do our entire planting work, but enough to supply other State institutions with these transplants instead of seedlings.

In our nursery at Amherst we have about 7,000,000 trees, about 1,500,000 of which are three and four year transplants suitable for our spring planting.

This year we supplied the Metropolitan Park Commission with 300,000 two-year white pine seedlings, the Metropolitan Water Board with 250,000 two-year white pine seedlings and 150,000 three-year Norway spruce seedlings, and a number of the commissions with smaller amounts, — a total of 734,000 supplied for use on State land, outside of land planted under the reforestation act, by this department.

STATE PLANTATIONS, 1913.

TOWN.	Acres.	Type of Land.	Variety planted.
Gardner, ...	87	Cut and burned over, .	White pine, Norway spruce.
Rutland, ...	55	Cut-over land, . . .	White pine.
Leverett, ...	24	Cut and burned over, .	White pine.
Leverett, ...	66	Cut and burned over, .	White pine, Norway spruce.
Shelburne, ...	42½	Cut and burned over, .	White pine, Norway spruce.
Nantucket, ...	83	Sandy plain, . . .	White and Scotch pine.
Westminster, . .	80	Cut-over pasture, . .	White pine, Norway spruce.
Spencer, ...	80	Cut-over pasture, . .	White pine, etc.
Spencer, ...	80	Cut-over pasture, . .	White pine, etc.
Lancaster, ...	32¾	Cut-over light land, . .	White pine.
Taunton, ...	64	Cut-over sprout land, .	White pine.
Boxford, ...	10½	Run-out mowing, . .	White pine and red pine.
Freetown, ...	9	Cut-over land, . . .	White pine.
Boxford, ...	24¼	Cut-over land, . . .	White pine.
North Andover, . .	44	Cut-over land, . . .	White pine.
Total, ...	782		

AMHERST NURSERY, 1913.

VARIETY.	Age (Years).	Number of Trees.
White pine seedlings,	1	3,000,000
White pine seedlings,	2	2,000,000
Red pine seedlings,	2	200,000
Norway spruce seedlings,	2	216,000
European larch seedlings,	2	66,000
White ash seedlings,	2	70,000
White pine transplants,	3	1,091,000
White pine transplants,	4	344,000
Red pine transplants,	3	21,000
Norway spruce transplants,	3	18,000
Total,	. . .	7,026,000

HOPKINTON NURSERY, 1913.

White pine transplants,	5	25,000
White pine transplants,	3	40,000
Norway spruce transplants,	3	30,000
Total,	. . .	95,000

BRIDGEWATER NURSERY, 1913.

White pine transplants,	3	400,000
Scotch pine transplants,	3	53,300
White ash transplants,	2	50,250
Total,	. . .	503,550

PLANTING DONE UNDER THE ADVICE OF THIS OFFICE.[1]

NAME.	Location.	Variety.	Number of Trees.
Metropolitan Park Commission,	Blue Hill Reservation,	White pine,	300,000
Metropolitan Water Board,	Wachusett System,	White pine,	250,000
Metropolitan Water Board,	Sudbury System,	Norway spruce,	150,000
Wachusett Reservation Commission.	Princeton,	White pine,	20,000
Bristol County School of Agriculture.	Segreganset,	White pine,	2,000
Norfolk State Hospital,	Norfolk,	White pine, hemlock, arbor vitæ.	12,000
			734,000

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[1] Trees furnished by State Forester (Amherst Nursery).

Each year a résumé of the season's work has been published, but some may be interested in having a complete summary of the work done under the reforestation act; therefore we have included in this report the following tables classifying the lots by counties and towns. The number of the lot is a part of our record system, and roughly indicates the order in which they were taken over. Where this number appears in heavy type it indicates that the lot was purchased outright by the State, the clause in the deed giving the owner the right to redeem the lot at the end of ten years being omitted. All other lots are subject to the privilege of redemption.

Summary of Lots taken under Reforestation Act.

	Lots.	Acres.
Purchased outright without privilege of redemption, . . .	20	849
Purchased with privilege of redemption, ...	20	914
Deeded without cost and with redemption privilege, . . .	66	2,690
Deeded without cost and without redemption privilege, . .	2	36

Complete List of Lots taken under the Reforestation Act (by Counties).

Lot No.	Town.	Acres.	Year planted.	Lot No.	Town.	Acres.	Year planted.
	Barnstable County.				*Middlesex County — Con.*		
55	Dennis, . . .	20	1912	36	Shirley, . . .	18	1910
61	Harwich, . .	15	1911	59	Shirley, . . .	19½	1911
18	Sandwich, . .	14	1909	104	Groton, . . .	13	-
19	Sandwich, . .	10	1911	105	Groton, . . .	4½	-
31	Sandwich, . .	20	-				
34	Sandwich, . .	52	1910		*Hampshire County.*		
54	Wellfleet, . .	6½	1912	30	Belchertown, . .	10	1910
62	Yarmouth, . .	21	1911	23	Pelham, . . .	16	1909
106	Barnstable, . .	17	-	24	Pelham, . . .	6	1909
109	Barnstable, . .	32	-				
					Nantucket County.		
	Middlesex County.			84	Nantucket, . .	83	1913
49	Carlisle, . . .	40	1910				
50	Hopkinton, . .	28	1912		*Norfolk County.*		
51	Hopkinton, . .	80	1912	74	Dover, . . .	13½	1912

Lot No.	TOWN.	Acres.	Year planted.
	Plymouth County.		
10	Carver, . . .	5	1909
78	Duxbury, . .	38½	1912
48	Kingston, . .	14	1910
60	Kingston, . .	140	1911
70	Norwell, . . .	10	1912
	Worcester County.		
8	Ashburnham, .	10	1909
9	Ashburnham, .	66	1909
38	Ashburnham, .	53¾	1911
39	Ashburnham, .	94	1911
40	Ashburnham, .	14	1911
56	Ashburnham, .	63	1911
71	Ashburnham, .	8½	1912
72	Ashburnham, .	19	1912
73	Barre, . . .	38	1912
45	Brookfield, . .	37	1910
47	Brookfield, . .	70	1910
57	Fitchburg, . .	27	1911
79	Gardner, . .	87	1913
27	Gardner, . .	93	1909
44	Holden, . . .	50	1910
3	Hubbardston, .	40	1909
4	Hubbardston, .	14	1909
17	Hubbardston, .	54	1909
21	Hubbardston, .	40	1909
22	Hubbardston, .	10	1909
42	Hubbardston, .	108	1910
52	Hubbardston, .	40	1911
53	Hubbardston, .	34	1911
63	Lancaster, . .	74	1911
66	Lancaster, . .	8½	1911
93	Lancaster, . .	32¾	1913
75	Oakham, . .	80	1912
20	Paxton, . . .	55	1909
58	Paxton, . . .	45	1911
80	Rutland, . .	55	1913
11	Spencer, . . .	35	1909
	Worcester County — Con.		
12	Spencer, . . .	23	1909
13	Spencer, . . .	5½	1909
43	Spencer, . . .	14	1910
90	Spencer, . . .	80	1913
91	Spencer, . . .	40	-
92	Spencer, . . .	80	1913
6	Templeton, . .	107	1909
26	Templeton, . .	60	1909
37	Templeton, . .	50	1912
1	Westminster, . .	40	1909
2	Westminster, . .	40	1909
14	Westminster, . .	92½	1909
15	Westminster, . .	36	1909
16	Westminster, . .	39	1909
87	Westminster, . .	80	1913
88	Westminster, . .	80	-
89	Westminster, . .	7	-
100	Westminster, . .	80	-
107	Gardner, . .	16	-
	Essex County.		
7	Andover, . .	40	1909
99	Andover, . .	44	1913
96	Boxford, . . .	10½	1913
98	Boxford, . . .	24¼	1913
25	Rowley, . . .	8½	1909
	Bristol County.		
69	Attleborough, .	24	1911
97	Freetown, . .	9	1913
94	Taunton, . .	64	1913
	Franklin County.		
67	Buckland, . .	166	1911
69	Buckland, . .	11	1911
101	Buckland, . .	75	-
32	Colrain, . . .	52	1910
33	Colrain, . . .	169	1910
41	Colrain, . . .	80	1912

Lot No.	Town.	Acres.	Year planted.	Lot No.	Town.	Acres.	Year planted.
	Franklin County — Con.				*Franklin County — Con.*		
28	Colrain,	80	1910	95	Warwick,	27	1913
29	Colrain,	80	1910	102	Warwick,	30	-
64	Greenfield,	4	1911	103	Warwick,	29	-
65	Heath,	41	-	108	Buckland,	10	-
81	Leverett,	24	1913		*Berkshire County.*		
82	Leverett,	66	1913	76	Becket,	10	1912
5	Montague,	26	1909	35	Peru,	68	1910
83	Shelburne,	42½	1913	77	Peru,	12	1912

FOREST MANAGEMENT WORK.

The established policy of making examinations of woodland property, either public or private, and of giving advice in connection with the proper management of the same has been continued. A list of these examinations follows: —

EXAMINATIONS.

Owner.	Location of Property.	Area (Acres).
Irving Smith,	Ashburnham,	2,500
Worcester Park Board,	Worcester,	200
Concord Golf Club,	Concord,	85
John Gifford,	Sutton,	150
F. F. Baldwin,	Hopkinton,	300
Jas. Richardson,	North Leominster,	34
Fred'k Bailey,	Chelmsford,	24
W. E. Barton,	Foxborough,	60
L. T. Reed,	Cummington,	60
Miss F. Rogers,	Cummington,	40
Miss F. Rogers,	Cummington,	60
Miss F. Rogers,	Cummington,	20
Miss Julia Steere,	Cummington,	20
Miss Julia Steere,	Cummington,	15
Mr. Alfred Mellor,	Cummington,	175
J. Baldwin,	Marion,	50
Ira Hersey,	Foxborough,	75

Owner.	Location of Property.	Area (Acres).
Miss E. Ferguson,	Cummington,	20
Mrs. B. V. How,	Dracut,	205
Park Board,	Walpole,	20
Canaan Line Company,	North Marlborough,	400
A. Harlow,	Cummington,	60
E. Drake,	Sharon,	5
Park Board,	Lynn,	2,600
W. T. Porter,	Dover,	50
Mr. E. Pettingill,	Cummington,	200
Farm and trade school,	Thompson Island,	15
Fish and Game Commission,	Wilbraham,	50
M. Farnsworth,	Shirley,	1
Taunton State Hospital,	Taunton,	50
E. P. Ripley,	Weston,	8
D. Hough,	Vineyard Haven,	40
Lakeville Sanatorium,	Middleborough,	75
Mixter Farm,	Hardwick,	30
Edith S. Price,	Topsfield,	25
State Sanatorium,	North Reading,	123
R. C. Robbins,	Hamilton,	3
Robbins Estate,	Tyringham,	500
W. G. Vinal,	Marshfield,	20
L. C. Wason,	Canton,	25
Watcha Club,	Marthas Vineyard,	500
G. E. Watson,	North Leverett,	200
Mr. Way,	South Sudbury,	20
Mrs. F. E. White,	North Brookfield,	13
Water Board,	Winchendon,	150
Moses Williams,	North Falmouth,	75
E. H. Alderman,	Chester,	50
Geo. Baker,	Concord,	30
W. C. Brown,	Concord Junction,	50
A. B. Cutler,	Dedham,	90
C. B. Cooley,	Granville,	25
C. S. Dana,	Weston,	12
C. H. Dana,	Buzzards Bay,	30
Ramage Paper Company,	Monroe Bridge,	612
Total,		10,250

The above list contains 54 examinations covering an area of 10,250 acres, expense, paid by landowners, $30.33.

The number of examinations made this year is six less than given in the last report. The area examined is, however, increased by 4,502 acres. Many examinations in the eastern part of the State that formerly came under this department have been turned over to the moth end of the work, so that both in number and area the work has shown a large increase during the past year. Examinations in chestnut woodlands affected with the bark disease have also been classified separately, and this too would tend to lower the number handled by this department.

SURVEYS.

The following is a list of the lots taken over for reforestation and for which surveys have been made. Maps in triplicate for these lots are on file at this office.

SURVEYS FOR PLANTATIONS.

OWNER.	TOWN.	Area (Acres).
E. P. Churchill,	Freetown,	9
F. D. Lewis,	Groton,	4
Mary F. Pierce,	Freetown,	70
F. B. Lewis,	Groton,	13
Geo. Davis,	Shelburne,	42
State lot,	Manchester,	7
H. Fiske,	Buckland,	75
H. Fiske,	Buckland,	10
E. Smith,	Barnstable,	7
E. Smith,	Barnstable,	17
F. H. Webster,	Warwick,	31
A. P. Webster,	Warwick,	28
H. S. Hodgman,	Montague,	26
H. C. Harrington,	Westminster,	80
H. C. Harrington,	Gardner,	16
Calvin Benson,	West Barnstable,	32
F. H. Rhea,	Boxford,	10
Total,		477

The total surveyed area for which maps have been made and are on file is 2,380 acres.

Working Plans.

Besides the above surveys there have been made four others, and the necessary data collected with which to produce working plans. These working plans will be completed during the present winter. It is not necessary to work these plans out in colors, as has been done at times in the past, for it is thought that a plan of one color, inked in, will answer the purpose as well and also save both time and expense.

The properties for which brief working plans have been made are owned and located as follows: —

	Acres.
Mr. S. Mellor, Cummington, ...	175
Mr. W. A. Barton, Foxborough, ...	60
Mr. L. T. Reed, Cummington, ...	60
Mr. W. T. Porter, Dover, ...	50

There will also be brought together, as soon as time will permit, sufficient data with which to make up a working plan for the Lynn Woods. It is encouraging to state that this well-known tract of woods, which in the past has been more or less neglected, may and probably will in the near future receive some of the attention so much needed to place the woods in a proper condition. That the Lynn Woods at the present time are in poor shape is evident to the most casual observer. Insect enemies and fires have raised such havoc in them that much of their former value and beauty have been lost. With the exception of a small percentage that has been thinned and sprayed, nearly the entire area is badly in need of immediate attention. Thousands of cords of wood should be removed as soon as possible, especially a large number of such trees as are particularly susceptible to future stripping by moths. Dead and dying wood and much scrub growth should be removed, thereby materially decreasing the fire danger.

It is confidently hoped that the city will place at the disposal of its Lynn Woods commission and water board a sufficient yearly appropriation to permit of the carrying on the needed work along forestry lines which will insure the proper perpetuation of the tree growth.

The needed line of procedure for carrying out such a piece of woods-work has been set forth in two reports from this office and submitted to the chairman of the Lynn Woods commission.

Thinnings.

Six thinning operations along strict forestry lines have been undertaken the past few months, two of which are about completed. One of these, the W. T. Porter lot in Dover, Mass., containing 50 acres, was stocked with a stand of such nature as to make very careful work necessary in order not to injure much of the young growth. A large part of the area was heavily stocked with white and pitch pine of all ages up to eighty to ninety years, also pasture birch, large red and white oak, maple, ash, chestnut, etc., all growing in a very mixed manner. Since much of the area was badly moth-infested, nearly all of the white oaks were removed. Also all pitch pine and pasture birch were removed from the tract. All told, several thousand feet of white pine, pitch pine and oak were felled, besides about 200 cords of wood.

The logs brought the following prices on the lot: white pine, $10, pitch pine, $8 and oak, $15 per thousand. The cordwood when sold should bring about $3.50 per cord on the lot. Regardless of the fact that operations were necessarily expensive on account of the badly mixed nature of the growth, it is thought that on the larger part of the tract expenditure and returns will be about even.

Mellor Lot.

Operations of a thinning nature have been started recently on the 175-acre tract of Mr. Alfred Mellor, in Cummington, but will not be completed for some time. The area is stocked with a heavy growth of mixed hardwoods and conifers of good size. There is much to do on this piece of woodland property to place it in the condition desired by the owner. In certain places where trees have been cut and logged by the old methods there are, as is usually the case, quantities of slash left as a breeder for forest fires. Much of this will be cleaned up and burned this winter. The trees on the property are of such size that much of the work to be done in the future should be carried on at a profit to the owner, whose intention it is to do about one-tenth of the work each year. This is probably the first piece of woodland thinning ever carried on in Cummington. It is hoped others will follow Mr. Mellor's lead.

The Barton Lot.

A thinning operation is now being carried on in Foxborough on the 60-acre tract of Mr. W. A. Barton, the tract constituting the woodland surrounding Sunset Lake. This is an operation consisting of the thinning out of about 150 cords of wood in a heavily stocked medium growth of mixed hardwoods and pine. It is thought the cost to the owner will be slight. All of the cordwood has already been sold on the lot.

Taunton Hospital Lot.

The tree growth covering about 50 acres at the Taunton State Hospital has been partly marked for thinnings, and a crew of men are at present engaged in removing the marked trees. This piece of woods is moth-infested and contains a large number of slowly dying trees of good size. It is the intention of Mr. Goss, the superintendent, to gradually underplant the entire thinned area. The small trees needed are to be furnished from the State nursery.

Markings will be completed in the near future over the entire tract, and it is hoped the choppers will have the marked trees cut, slash burned and the area ready for underplanting by the spring of 1914. The choppers are men employed by the institution, and all wood cut is used there.

Reed Lot.

The W. A. Reed property of 60 acres in Cummington, containing a good growth of mixed hardwoods and conifers of various ages, has been marked for heavy thinnings, and the marked trees are to be removed if possible this winter. The cutting and hauling of the logs, of which there will be several thousand feet, will be done by a local contractor. The major part of the lumber will be used by the owner.

A certain portion of the area is open land, and suitable for planting. It is the owner's intention to have this area stocked gradually from year to year, and to carry on all work done under advice from this office.

Greenfield Lot.

The Greenfield Women's Club purchased a tract of land known as Temple Woods on a steep, rocky ledge east of the town for the purpose of preserving the timber thereon, as it is in a region used by the people of Greenfield as a park. The growth is of considerable size and age, and is made up of pine, oak, chestnut, hemlock and hickory. Owing to the thin and rocky soil, and also, in part, to a fire that had been through a portion of the tract some years ago, many of the trees were dead or in poor condition. It was thought best to cut this over-mature growth and thus thin the woods. The chopping was done by our own men, the hauling was let out to a farmer, and the lumber was sold in the log to a mill man in Greenfield. About four acres of open land were planted with young pines, and all slash and brush left after logging were piled and burned. About 50,000 feet of lumber and 35 cords of wood were cut. Owing to the rough and precipitous nature of the land, and the lack of snow during the logging season, the expense of the work was heavy, but the returns about balanced the outlay.

Thinnings on Mountain Tracts.

It is hoped that this year permission can be obtained from the owners of the woodland property, upon which some of the State observation stations are located, to allow a forester from this office to make certain markings of the trees thereon, with the object in view of having the observation men make cuttings during such time as they may have when weather is not suitable for observation work. Such operations would of course be carried on slowly, but much good could be accomplished in time at practically no expense.

There should be many owners desiring to have their woodlands thinned this coming year. The good accomplished by proper thinnings is very apparent. Fire danger is very materially reduced, while the woods are much more accessible. If infested with moths this danger is lessened, the trees left are in better growing condition, a better stand is assured, and, generally, thinned woods lose little of their value from an æsthetic point of view.

Maps.

There were completed during the past year 24 maps for the use of the State Fire Warden and his observers. Nearly every outlook station in the State was fitted out with a new table map and alidade for use in locating forest fires. These maps consist of the United States government topographical sheets placed together, upon which the town boundary lines were laid out. We are indebted to the Harbor and Land Commission for the use of the town boundary lines obtained by the commission from comparatively recent surveys.

A large line map was also made for use in fire work, and also several maps for the moth department. There is still a good amount of map work to be done as soon as time will permit.

A recent feature in connection with the survey work carried on by this department is the marking of all corners on State lots with a 3-foot section of steel pipe. These pipes and stones make corners that cannot be eliminated or injured by fire, and should last at least fifteen to twenty years. It is very essential that lot corners be so marked that any future trouble may be eliminated. It has been impossible to place these steel corners on any except recently surveyed lots on account of lack of time, but as fast as possible this year the re-marking will be attended to.

A summary of some of the work accomplished by the forest management branch of the department in the past few years is as follows: —

EXAMINATIONS.	Number.	Area (Acres).	EXAMINATIONS.	Number.	Area (Acres).
1904, ...	14	2,000	1909, ...	60	15,862
1905, ...	36	6,545	1910, ...	49	6,495
1906, ...	47	9,357	1911, ...	66	9,694
1907, ...	37	8,713	1912, ...	58	5,748
1908, ...	65	15,842	1913, ...	54	10,250

CHESTNUT BARK DISEASE.

We have been very solicitous in this State as to the effect of this malady upon our chestnut trees during the past few years. The bulletins published by the State Forester have

A mixed mature stand at Norwell, showing white oaks on the right over one hundred years old and white pine trees on the left about fifty years of age. This lot is being operated on account of the gypsy moth infestation. The white pine is worth ten times the oak; further, the pine is resistant in clear stands. This explains why white pine is popular in reforestation.

served to give the information necessary to identify the disease, and as far as we know, what to do for it.

Early last spring I took a trip to Pennsylvania and Washington, D. C., to ascertain the latest information regarding the chestnut bark disease. The State of Pennsylvania has had a special State commission and a large appropriation for this work. The Bureau of Plant Industry of the United States Department of Agriculture has also had an appropriation of $80,000 a year from Congress, and has had experts in the field. This latter appropriation was made possible through the special interest taken by our Massachusetts senators, Messrs. Crane and Lodge. This trip resulted in my learning the latest methods in Pennsylvania, and in securing an appropriation of $3,000 from the Bureau of Plant Industry as the government's contribution to the State in attempting some co-operative work.

This season's work was immediately inaugurated, and free assistance and advice were offered to any one in the State having chestnut growth. Mr. Murdoch, one of my assistants who had had previous experience in the work, was put into the field and later we secured the services of Mr. Roy G. Pierce, who has been in our employ since early in July. Mr. Pierce is a graduate of the University of Michigan School of Forestry, and later was connected with the United States Forest Service. Previous to coming to Massachusetts he was employed for a year by the Pennsylvania Blight Commission, coming to us, therefore, well recommended.

Discovery in Massachusetts.

The chestnut blight was not found in Massachusetts until 1909, at which time 4 cases were authentically reported. The evidence found later indicates its presence as early as 1905 or 1906. In the summer of 1911, as reported in our bulletin, it was found in 72 towns. Since that time the blight has been found in at least 200 towns and cities in the State, and it is very probable that it is now in every town and city where chestnut grows to any extent.

Examinations for Blight.

Up to July, 1911, the work consisted mainly of examination of woodlands for individual owners, and of general scouting to ascertain the prevalence of the disease throughout the State. In 1911, 6 of these special examinations were made for the blight. This was increased to 28 in 1912, on 2,291 acres. During the past year the examinations have been increased by 174 on approximately 8,000 acres of land.

Educational Work.

Since Mr. Pierce's connection with the work we have been able to broaden out along several lines. The educational feature has been emphasized as being a very necessary part in the problem of bringing before our people the methods of handling chestnut woodlands affected by the bark disease.

The State Grange field meetings were attended at Waban, Billerica, Springfield, Greenwich Village, Berkshire Park, Colrain, Athol and Leominster. At each of these summer meetings specimens of the chestnut blight fungus were exhibited, and the manner of spread, the symptoms of the disease and its importance were shown to all those who were interested. The State Forester's bulletin on the "Chestnut Bark Disease" was generally distributed at these meetings.

Three of the largest fairs of the State representing the eastern, middle and western sections were attended, namely, at Brockton, Worcester and Great Barrington. At Brockton and Worcester, through the courtesy of the extension department of the Massachusetts Agricultural College, ample table and wall space was secured for an excellent exhibit of logs from blight-killed chestnut trees, also specimens of bark from thin and thick barked trees, showing the characteristic appearance of the blight canker or blister on the former and the reddish brown pustules of the fungus in the cracks of the latter. Photographs, bulletins and charts were also displayed. Hundreds of wood-lot owners stopped for advice and to ask questions regarding the blight. Mr. Pierce gave a paper before the Massachusetts Tree Wardens' and Foresters' Association in Boston on August 22. Addresses were also given before the granges or local organizations at Montgomery, Blandford, Granville, Palmer and Brimfield, and before two classes at the Framingham Normal School.

Numerous press notices have appeared in the papers regarding the chestnut blight work in the State. Without this help from the press the people could not have been reached in the way they have been. The results of this educational work have been encouraging.

During the season this department has begun some effective forest-mapping work, as noted elsewhere in this report, and this offered an exceptional opportunity to systematically determine the chestnut-blight conditions. A brief description of the infestations as found in the following towns may prove of interest: —

Auburn. — The chestnut blight has not made much headway in Auburn as yet. A number of isolated cases were found, but nothing threatening great damage at present.

Blackstone. — The per cent of timber land covered with chestnut comprises at least one-half of the total, and probably two-thirds has some chestnut on it. The bark disease, although present in nearly all extensive stands of chestnut, seldom exceeds one affected tree per acre. West of the Mendon Road, near the Mendon-Blackstone line and in the extreme northwestern corner of the town, are large tracts with 5 or more infections per acre, these being the worst cases of the disease in the town.

Douglas. — Chestnut bark disease scattered. Only individual trees attacked throughout the town. More prevalent in northern half, and usually among smaller growth. Chiefly noticeable around East Douglas.

Dudley. — In the timber along the western part of the town the chestnut bark disease occurs, but not very widely distributed. In young sprout stands, of which there are large areas, it is practically everywhere. There is very little evidence of its presence in the larger chestnut area in the eastern part of the town.

Grafton. — Chestnut constitutes practically 70 per cent of the woods. Blight infections in stands 10 inches and over in diameter will not average more than 2 or 3 to the acre. Some of the stands are entirely free from it. In young sprout areas the disease is spread much more, in most cases about 10 to 15 young trees to the acre being infected. Some 200 acres of young sprout land, north of Goddard Pond, between the railroad and the road to the north, is pretty generally infected. The disease is found throughout the entire town, but is far more prevalent on the younger trees.

Northbridge. — The chestnut blight has badly infected young chestnut sprout lands, much of which occurs in this town. Almost every plot of young chestnut contains infected trees. In the western part of the town, in the woods of larger trees, the blight is not very prevalent. It occurs scatteringly in practically all chestnut woods in the eastern part of the town.

Sutton. — The chestnut blight occurs practically everywhere in the young sprout lands. The older trees as yet do not show the effects. In one place, situated about midway up the eastern boundary of the town it has killed every tree, and at present is spreading fast in all directions.

This chestnut bark disease work the State Forester has organized for purposes of economic effectiveness, as follows: The assistant in immediate charge, who is an expert, is given a definite policy to carry out. The expert, Mr. Pierce in this case, is then authorized to enlist the assistance of the regular staff of this organization as a large auxiliary body of men to report their observations as they travel about the State. This necessitates the acquaintance of the men with the disease. Co-operation in this way increases the amount of good the department may do; also broadens and develops our employees for greater usefulness.

Besides the assistants and division men, forest wardens, moth superintendents and patrolmen are all included.

Recommendations.

Studies made throughout the State show that the younger thin-barked chestnut sprouts have become affected by the chestnut bark disease to a much higher per cent than older stands of thick-barked trees; that is, while the younger trees are often infected from 25 to 100 per cent, the older trees near by would show infection from only 1 to 10 per cent.

While it is possible by removal of blight cankers and diseased limbs on valuable lawn and park trees, or on grafted nut trees, to prolong the life of chestnut trees affected by the bark disease, yet this sort of treatment is not applicable to forest trees. Wherever the chestnut blight has affected the trees in the forest, the only treatment possible to check the disease is the prompt removal of the infected trees. This is specially advised where the diseased trees are large enough to produce valuable products, as poles, ties, posts and cordwood.

The removal of all near-by sources of infection will render the timber less liable to be infected in the future, since the blight seems to spread faster from local centers to near-by trees than to trees at a distance.

Better forest practice is needed in combating this disease. The general practice has been to clean-cut the chestnut and oak stands in southern New England without intermediate thinnings. This has often been wasteful. The trees which make up the dominant growth in forty or fifty year old stands have had to fight for light, food and moisture at the expense of the weaker trees. Proper thinnings would tend to reduce the fierce competition, give an intermediate yield, as well as cut down the time at which the trees would reach a merchantable size. The experiments of European foresters have shown that the rotation of the timber crop can be shortened by judicious thinnings from 10 to 20 per cent.

Since it seems that the smaller chestnut trees in Massachusetts are liable to be infected by the chestnut bark fungus to a greater extent than larger trees, it may be concluded that the faster the small trees can be made to grow, the quicker will they become more resistant to the disease. The rate of diameter growth may be very materially increased by proper thinnings.

As heretofore, this department stands ready to advise any owners of chestnut growth, as to its present and future management, at no expense. It is more satisfactory to both parties where the owner goes over the woodlands personally with the expert. For examinations, make application to this office.

REPORT OF THE STATE FIRE WARDEN.

Mr. F. W. RANE, *State Forester.*

SIR: — In compliance with your request, and in accord with the provisions of chapter 722, section 2, Acts of 1911, I beg to submit the following report of the work accomplished by this branch of the department this year: —

The same division of the State has been continued again this year as follows: District No. 1, Essex, Middlesex and Norfolk counties; District

No. 2, Barnstable, Bristol and Plymouth counties; District No. 3, Worcester County and west to the Connecticut River; District No. 4, Berkshire County and east to the Connecticut River. Each district is under the supervision of a district forest warden. Two changes have been made in the personnel of the district forest wardens. Mr. James E. Moloy, who has had supervision of District No. 1, was made inspector of locomotives, being succeeded by Mr. Oscar L. Noyes. Mr. Albert R. Ordway has been appointed district warden of the 4th district to succeed Mr. Frank L. Haynes, who has been promoted to the position of assistant forester, assisting in the forest management work.

The district forest wardens have full supervision of the work in their districts, being in charge of the several observation stations, as well as constructing telephone lines, erecting steel towers, map-making, visiting each town and consulting with the selectmen and town forest wardens and deputies relative to the need of additional equipment for handling fires, and perfecting better forest fire-fighting organizations. This may seem a very easy matter, but when we take into consideration that we have 354 towns and cities, and that the matter of purchasing equipment must be brought before the citizens at their annual or special town meetings, it means an immense amount of work.

In the work of perfecting town forest fire-fighting organizations we have been handicapped owing to the appointment of 354 town and city forest wardens being made by the selectmen of as many towns, this department simply having the approval of them. The result is that we still have inefficient men in some towns, — men who are not interested in the preservation of the forests and who know little, if anything, about handling forest fires. This should be remedied by these appointments being made by this department, thus making the department responsible for the results. We should then have efficient men in every town.

We have had in operation this year 21 observation stations reporting to the town forest wardens 3,238 fires.

District No. 1. — In addition to the four observation towers already established in this district we have erected and equipped two 40-foot steel towers. One of these is located in the town of Essex on Morse Hill, which covers all of Cape Ann, as well as all the valuable timber land along the North Shore. We are deeply indebted to Col. Wm. D. Sohier, chairman of the North Shore summer residents committee, for his liberal contribution of $900 toward the tower and 7 acres of land which were acquired and donated to the Commonwealth. This tower was completed April 24 and used throughout the season. The second tower was built on Hart Hill in the town of Wakefield, this hill being a part of the city reservation and making an ideal location for a tower. The town of Wakefield contributed $350 toward this tower.

It is very important that a tower be placed on Nobscot Hill in the town of Framingham during the coming year, in order to assist several towns that are now receiving no protection. These unprotected towns will contribute liberally toward such a tower, which will complete the observation system in District No. 1.

District No. 2. — Two new 40-foot towers have been established in this district, one at North Hanson and one at Bournedale. The North Hanson tower is located on Bonney Hill and commands an excellent view. The towns of Duxbury, Hanson, Hanover, Halifax, Pembroke, Plympton, Marshfield and Whitman contributed $725 toward the purchase of this tower. The Bournedale tower, located near the Bourne and Plymouth line, covers a large tract of valuable forest land, as well as many acres of burned-over areas in the towns of Bourne and Sandwich. The towns of Bourne and Wareham contributed $450 toward the erection of this tower. This burned area should be reforested, and with the protection derived from this tower and the hearty co-operation of the citizens of these towns, there should be very little danger of any such fire as experienced there this year.

Three other stations should be established in this district in order to completely cover it, located at Falmouth; Harwich and Fall River. The officials of these towns have expressed a desire to contribute very liberally if towers are located there. It is expected that the citizens of Barnstable and Yarmouth will purchase a new steel tower to replace the old wooden one now in use at Shoot Flying Hill. Owing to the unsafe condition of the old tower during heavy winds that prevail in that locality, and to the many visitors who frequent this tower, it is extremely necessary that a new tower be erected. The citizens of Middleborough, Lakeville and Carver are contemplating the establishment of a tower on Bardons Hill in Middleborough, which will cover these towns as well as other surrounding towns. We have used the town hall at Middleborough this year, but have not been able to obtain nearly as good results as would have been obtained from Bardons Hill. With these extra towers we shall be able to protect all the forest area in this district.

District No. 3. — Two temporary stations have been added in this district this year, — one on little Muggett Hill in Charlton, which was used two months during the spring, and one on Lincoln Mountain, in Pelham. An old wooden tower was repaired and used at this latter station throughout the season. Several influential citizens of Amherst and surrounding towns have signified their desire to contribute liberally toward installing a steel tower at this point. It is necessary that the northern and southern portions of this district be better protected by the addition of at least two more stations, but as no co-operative agreement is in operation between this State and the States of New Hampshire and Connecticut, it is not advisable to erect such towers until some satisfactory agreement can be reached relative to the proportionate charge for maintenance to be paid by the above States.

District No. 4. — Owing to the discontinuance of the use of Greylock Mountain as an observation station, it has been necessary to build a temporary tower in the trees on Tower Mountain in Savoy, which was used a portion of the season. It is necessary that three new stations be established in this district along the boundary lines of Vermont, New York and Connecticut, but the same consideration arises as to the future maintenance as in District No. 3. It is hoped that some definite agreement may be reached at once with the federal department and with adjoining States which will permit the establishing of these stations, thereby completing our observation system.

Owing to the large number of people visiting our observation stations it has been found advisable, from an educational standpoint, to provide better means for reaching the observation rooms, so that they may be made accessible to women and elderly people. With this point in view, and with the generous contributions made by the different towns, we have equipped all our towers purchased this year with spiral or fire-escape stairs, with two landings before reaching the top. From the reports received from our observers it is surprising to note that we have had nearly 3,000 people visit our towers this season, representing nearly every State in the Union and many of the foreign countries.

Forest Fire Equipment.

Under an act of the Legislature passed in the spring of 1910, appropriating $5,000 annually for forest fire protection, towns with a valuation of $1,500,000 or less are entitled to 50 per cent reimbursement on all forest fire-fighting equipment they desire to purchase not exceeding $500, no town being allowed an amount exceeding $250. All forest fire equipment purchased under this act is approved by this department and placed under the supervision of the town forest warden, subject to inspection at all times by the State Fire Warden or the district forest wardens.

We have at the present time 156 towns coming within the provisions of this act, and during the four years it has been in operation 108 towns have taken advantage of it. This year 53 towns have exhausted the appropriation. Until this year it has been extremely difficult to impress upon the citizens of the central and western parts of the State the importance of providing their towns with proper equipment, but of this year's appropriation, over $3,000 was expended in Districts Nos. 3 and 4. The style of equipment desired varies in the different parts of the State. Throughout the eastern part fire extinguishers work to exceptionally good advantage in checking any ordinary fire, but in the western hilly country it is extremely difficult to convince the public that they can be used to good advantage at such fires, many preferring the old method of using shovels and dirt. These towns expend very little money for equipment of any nature; consequently, out of 56 towns west of the Connecticut River that are entitled to reimbursement but 18 have taken advantage of the act.

There are at the present time 198 towns whose valuation exceeds $1,500,000, and that are, therefore, not entitled to reimbursement. Several of these towns have purchased equipment this year, thereby better protecting themselves from the ravages of the fire evil. In 1910, when the reimbursement law was enacted, there were 178 towns coming under the act. During the past four years the valuation of 22 of them has increased so that it now exceeds $1,500,000, and they are no longer entitled to reimbursement. Owing to no special effort being made by this department along this line until the past two years, it seems but fair that the law be amended, making the valuation limit $1,750,000, thereby allowing these 22 towns to take advantage of the act. The following tables on pages 375 to 377, show, first, an itemized statement of the equipment purchased since the enactment of the law and the amount received by each town from the Commonwealth during that period; second, a list of the towns having purchased equipment *this year* and the amount of reimbursement received by them. This department holds receipts from the town forest wardens for all equipment purchased under the act.

Railroad Fires.

The railroad fire situation is gradually improving, but owing to the fact that there are over 2,000 locomotives, and over 2,500 miles of right of way within this State, it is very evident that a vast amount of work must be done to eliminate railroad fires. In addition to the above we have the many miles of slash accumulation adjoining the right of way where owners seem indifferent, preferring in many instances to allow the burning of it by sparks from locomotives, whereby they may get a fair revenue in the form of damage claims, rather than to dispose of it themselves and thereby eliminate the danger of fires during severe drought.

Through the courtesy of the Board of Railroad Commissioners and the consent of the railroad officials this department has been able to maintain a system of locomotive inspections, one inspector being detailed on this line of work and vested with authority to inspect the spark arresters and ash pans of locomotives in operation throughout the State. In addition to this, the New York Conservation Commission has inspected all locomotives running into New York State, thus improving the condition of locomotives used in the western part of Massachusetts. Our records show that 1,105 locomotives were inspected, of which 26 per cent of the Boston & Albany locomotives, 23 per cent of the Boston & Maine locomotives, and 49 per cent of the New York, New Haven & Hartford locomotives were defective. A large percentage of the defective locomotives were found in the early part of the season. As the season advanced, and extra men were assigned to repairing the defects and installing new screens where necessary, inspections showed a very decided improvement, very few defective locomotives being found. As this inspection work is most important, it is necessary that at least one more inspector be employed this coming season.

Mr. E. A. Ryder, who has charge of the fire prevention department of the Boston & Maine Railroad, is certainly deserving of a great deal of credit for his excellent record in reducing the fire claims of that road in the past two years. From a loss of $200,000 in 1911 to one of less than $50,000 this year is certainly very commendable, especially so when we take into consideration the continuous drought that was experienced in this State this year, producing a condition for fires almost unprecedented. In order that still better results may be obtained, this road is equipping all locomotives running over the Central Massachusetts division with the Mudge-Slater spark arrester, a device which has been used with great success on the Chicago & Northwestern Railroad in the west and on the Maine Central Railroad in the east. They are also to maintain a patrol service along dangerous sections, patrolmen being provided with gasoline speeder cars which will accommodate two men and the necessary equipment for their use.

The results accomplished by the New York, New Haven & Hartford Railroad have not been as satisfactory as was desired. Little attention was paid to defective spark arresters until the matter was called to the attention of the vice-president of the road, showing the vast amount of money expended by the road for settling fire claims and extinguishing fires, and that little or nothing was being done to remedy the cause of these fires. Orders were at once issued requiring that special attention be paid to all spark arresters and ash pans, and inspections made late in the season showed a very decided improvement.

Our railroad fire reports show that we have had 913 railroad fires, as follows: Central Vermont, 65; Boston & Albany, 151; Boston & Maine, 232; New York, New Haven & Hartford, 465; burning over an area of 16,620 acres, with a cost to extinguish of $8,930 and a damage of $64,222.

Owing to the large number of fires throughout the Cape country, the greater per cent of which were caused by locomotives, the Public Service Commission was petitioned, under date of August 19, as follows: —

To the Public Service Commission:

Respectfully represents F. William Rane, as he is State Forester, that in that part of the Commonwealth comprising Barnstable County there have been for many years past a very large number of fires set in the grass lands and woodlands by sparks from locomotives operated by the New York, New Haven & Hartford Railroad Company; that many of these fires have burned over large areas of woodlands and destroyed large quantities of wood, both cut wood and standing wood, and fires spreading from these fires in the woodlands have burned and destroyed dwellings and other buildings; that many complaints from private citizens residing in the different villages and towns in said county have been made to him, as State Forester, all calling attention to the large number of fires that have been set by sparks from locomotives; that your petitioner has repeatedly called the attention of the officials of said railroad to the above conditions, and said officials have, by the installation of spark arresters on the locomotives, and by clearing up and burning the grass within the locations, sought to prevent the escape of sparks from the locomotives and the starting of fires, but the number of fires has increased rather than decreased; that a careful investigation has been made and the following appear to be the conditions throughout the entire county, from Buzzards Bay to Provincetown, from Buzzards Bay to Woods Hole, from Yarmouth to Hyannis, and from Harwich to Chatham, to wit: there is only a single track on the main line and the above branches, with sidings at the different stations; that the roadbed over its entire length is of very uneven and varying grades; that there are operated daily a large number of trains, both freight and passenger; that because of said different grades, and because of there being but a single track, there is necessity of making the schedules so that the trains may meet and pass at the meeting points; that the locomotives of necessity in many instances have to be run at forced draft, and therefore many sparks are emitted from them and many fires are thereby set; that during the past summer months a very large number of fires have occurred, and reports and complaints are being daily received by the State Forester of the numerous fires that are being set, both within and adjoining the railroad location, by sparks from the locomotives, which fires spread over the adjoining lands of private owners; that in consequence of these many fires many of the communities are in comparative fear of fires and of the damage resulting from them; that while the number of fires has been very great during the immediate past two months, owing probably to the unusual dryness of vegetation, yet during all the year, when conditions are normal, an unusually large number of fires are set in this county by sparks from locomotives; that the railroad company has made an effort to reduce the number of fires by clearing up its right of way and by equipping engines with spark arresters, but the dryness of the vegetation and the unevenness of the roadbed, requiring heavy firing of the locomotives at many parts of the system in this county, has resulted in causing a large number of fires to be set (for example, it is reported from the village of Barnstable that in a distance of less than 2 miles 11 fires were started on Saturday, August 16; an actual count of burned places within and just outside the railroad location, between the railroad stations at West Barnstable and Barnstable, a distance of 4 miles, shows that a total number of 70 fires have already been set during the present summer, and a casual observation while riding on the train shows that a very large number of fires have been set within and adjoining the railroad location throughout the whole length of the line in said county); that your petitioner, in his capacity as State Forester, acting under the authority of acts of the different Legislatures, has been for several years establishing nurseries and plantations in different parts of the Commonwealth for the growing of trees, and has set out in various parts of Barnstable County plantations of trees, all of which is being done both to create a new growth of trees and also to encourage among private individuals the further growth of timber growing within the Commonwealth and in that county; that in consequence of the many fires which have been set by sparks from locomotives and from other causes, the nurseries and plantations of trees have been seriously menaced; that further introduction has been retarded and private individuals have hesitated to engage in forestry work; that a careful investigation of the conditions has convinced your petitioner that the only remedy for preventing the setting of the large number of fires is by a change of means of operating the engines of the New York, New Haven & Hartford Railroad Company from the present coal-burning fuel engines to either the electrification of that part of the New York, New Haven & Hartford Railroad system which it operates in Barnstable County, or by equipping the present engines, now equipped to burn coal only, with such devices as will allow the burning of oil; that the electrification of that part of the line of said railroad, while it would permanently prevent a recurrence of the present conditions, yet seems to be impracticable at the present time because of the cost of installing such a system; that the use of oil-burning engines in other parts of the United States, where railroad locations run through forest and woodlands, has shown that the use of such oil-burning engines has resulted in practically an entire stopping of fires.

Wherefore, your petitioner respectfully prays that your honorable board may determine that only engines equipped with oil-burning devices shall be operated by said railroad company in Barnstable County, and will make an order requiring said railroad company to forthwith so equip its engines for use in said county with oil-burning devices, and operate only such engines in said county.

In response to the above petition the following order was issued: —

It is

Ordered, That a copy of this petition be sent to the New York, New Haven & Hartford Railroad Company with the request that it make report as to the feasibility of substituting oil for coal, particularly in the Cape district; also as to the comparative cost of the two methods of supplying fuel for the engines, including also consideration of economics by reason of saving in damage claims for forest fires set.

It is further

Ordered, That the petition stand for public hearing on Sept. 22, 1913, at 10.30 o'clock in the forenoon, to be duly advertised.

Attest:

(Signed) ALLAN BROOKS,
Assistant Secretary.

The State Forester's department was represented at this hearing by Deputy Attorney-General Henry M. Hutchings, acting attorney for this department. Nearly 100 residents and property owners residing in Barnstable County were in attendance, including the Hon. Thos. C. Thatcher, who made the trip from Washington especially to be heard on this matter, Wm. C. Adams, representing the Fish and Game Commission, Chas. C. Craig, representing boards of trade of Falmouth and Cape Cod, delegates from many granges, and members of the boards of selectmen of every town in Barnstable County. A whole day was devoted to the discussion, at the conclusion of which the chairman of the Public Service Commission stated publicly that it had been proven to the satisfaction of the commission that the forest-fire situation along the railroad was critical. At the conclusion of the hearing a statement was filed with the railroad requiring certain information relative to the present operating expenses of the road within Barnstable County. Upon receipt of this information a second hearing is to be called at which expert testimony will be introduced showing the approximate cost of burning oil as compared with the present expense of operation.

RURAL MAIL CARRIERS.

The results obtained from the co-operation with the 300 rural mail carriers within the State were not as satisfactory as we had expected, this being undoubtedly due to the fact that this department is not in direct touch with the carriers, all instructions from this office being submitted to the postmasters. During the last of the season we deviated somewhat from this plan and requested our district wardens to personally call on the carriers, whenever an opportunity presented itself, and interest them in this line of work. These interviews have already shown results, and I feel that when we are able to get in touch with all the carriers greatly improved results will be shown. Our reports from the postmasters show that 144 fires were reported by the carriers during the year. This number would undoubtedly have been very materially increased if reports had been received direct from the carriers.

Federal Co-operation.

The Weeks bill passed in 1910, providing for the purchase of portions of the White Mountain and Appalachian Mountain regions, also provides for the protection against fires of watersheds of navigable streams in the United States. The co-operative work in this State is confined to the watersheds of the Nashua, Chicopee, Miller, Thames, Blackstone, Hudson, Connecticut and Deerfield rivers, and an allotment of $3,000 was made by the federal department for carrying on the work within these watersheds. This fund was used for the payment of observers in the various observation towers throughout the central and western parts of the State. This appropriation has made it possible to better protect the above watersheds than would have been possible under our limited State appropriation.

Danger from Slash.

The greatest fire evil this department has to contend with is the slash problem. It is impossible even to give an estimate of the number of the thousands of acres of slash there are left upon the ground throughout the State at the present time, but some idea may be reached when we take into consideration that there are 297 portable sawmills in operation, and in only 12 instances has there been any disposition made of the slash. We also have over 300 miles of power line, a large percentage of which runs through forest lands. These lines are cut, in most instances, 150 feet wide, and in nearly every case the slash is piled against the adjoining forest area. These power lines would make excellent fire lines, provided they were cleaned and the brush disposed of.

Then we have the many miles of highway where not only do we have the accumulation of slash on property adjoining the highway, but the land within the road limits is not cleaned in many instances. If this were cleaned the many fires starting from automobile parties and others carelessly throwing lighted matches, cigars and cigarettes along the roadside would be lessened very materially. The time is certainly at hand when legislation should be enacted that will improve the slash conditions throughout the State and put a stop to the enormous damage from fires from this cause.

Boy Scouts.

The following communication from Scout Commissioner Ormond E. Loomis of the Greater Boston District gives a very good idea of the interest shown by the Boy Scout organization in the prevention of forest fires.

Mr. M. C. Hutchins, *State Fire Warden, 6 Beacon Street, Boston, Mass.*

Dear Sir: — Complying with your request that we submit a report showing to what extent the Boy Scouts in Massachusetts have benefited the State by checking or stopping forest or brush fires, I am glad to send you herewith the very meager information given me. This is accurate for Greater Boston alone, as our office has supervision only over scouts in the towns of Greater Boston, that is, those in towns within a 10-mile radius of the State House.

Scouts in this territory have discovered and reported many small brush fires in sections of our State reserve and in large wooded estates in the vicinity of Boston, especially in Milton, Quincy and Braintree districts and the Waltham, Medford, Lexington and Wakefield districts. Through your State officials and fire wardens in the various outlying districts you have doubtless already heard of the work done near Falmouth, Gardner and Fitchburg, and that done out in the Berkshire Hills. Of these I have only the general newspaper reports.

Special groups of scouts in smaller towns have patrolled dangerous sections near railroad tracks during the extra dry season of the summer. They were probably instrumental in locating several small fires that might have been seriously damaging, but it is difficult to say accurately just how much value their services were. Numerous instances have come to my attention in which boys have stopped grass fires, but in most cases these were considered by them so unimportant that no special reports were made.

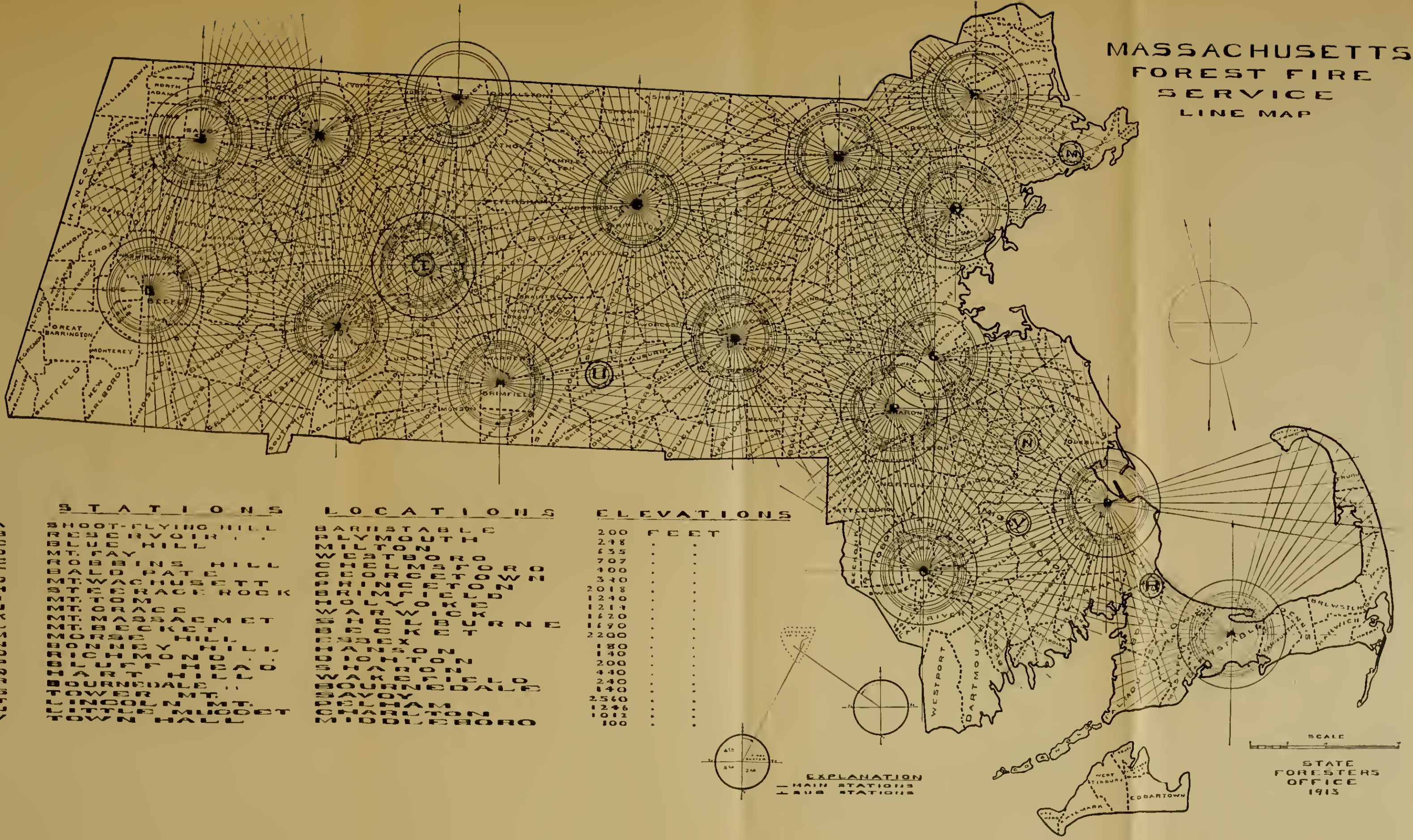
It is my belief that much more has been done during the year in the way of prevention than by actual work in stopping fires already started. The bulletins furnished by you to our scout officials have done more than any other one thing to instruct them as to what the law in Massachusetts, regarding the lighting of fires, is, and to indicate to them what they should do whenever they observe a fire. The information contained in the pamphlet has been freely disseminated so that scouts also are now fairly well informed as to what they should and should not do when traveling afield. Perhaps it is safe to assume that their knowledge and caution has had a good influence on others who might have committed offences and upon those who, because of lassitude or indifference, were slow to inform the State authorities that offences were being committed.

In the interests of further safety and instruction I should like very much to have a new supply of pamphlets to distribute to those who have become scout masters since your first distribution of the information bulletins.

Appreciating your kindly interest in the work of the scouts and your desire to educate them in their duties as future citizens of the Commonwealth, I am

Sincerely yours,
ORMOND E. LOOMIS,
Scout Commissioner.

MASSACHUSETTS FOREST FIRE SERVICE
LINE MAP


EXPLANATION
MAIN STATIONS
SUB STATIONS
SCALE
STATE FORESTERS OFFICE
1913

	STATIONS	LOCATIONS	ELEVATIONS
A	SHOOT-FLYING HILL	BARNSTABLE	200 FEET
B	RESERVOIR	PLYMOUTH	248 " "
C	BLUE HILL	MILTON	635 " "
D	MT. FAY	WESTBORO	707 " "
E	ROBBINS HILL	CHELMSFORD	400 " "
F	BALD PATE	GEORGETOWN	340 " "
G	MT. WACHUSETT	PRINCETON	2018 " "
H	STEERAGE ROCK	BRIMFIELD	1240 " "
I	MT. TOM	HOLYOKE	1214 " "
J	MT. GRACE	WARWICK	1620 " "
K	MT. MASSAEMET	SHELBURNE	1690 " "
L	MT. BECKET	BECKET	2200 " "
M	MORSE HILL	ESSEX	180 " "
N	BONNEY HILL	HANSON	140 " "
O	RICHMOND "	DIGHTON	200 " "
P	BLUFF HEAD	SHARON	440 " "
Q	HART HILL	WAKEFIELD	240 " "
R	BOURNEDALE "	BOURNEDALE	140 " "
S	TOWER MT.	SAVOY	2560 " "
T	LINCOLN MT.	PELHAM	1246 " "
U	LITTLE MUGGOET	CHARLTON	1012 " "
V	TOWN HALL	MIDDLEBORO	100 " "

Inventory of Equipment purchased under the Reimbursement Act.

Town.	Axes.	Cans.	Extinguishers.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wire Brooms.	Wagons.	Reimbursement.
Acushnet,	1	10	16	-	-	-	4	1	-	-	-	1[1]	$143 22
Ashburnham,	-	-	8	-	-	-	-	-	-	-	-	-	25 00
Ashby,	-	-	12	-	-	-	-	-	-	-	-	-	34 50
Ashfield,	-	-	33	-	-	-	-	-	-	-	-	-	99 00
Ashland,	-	6	10	-	-	-	12	6	-	6	12	-	77 31
Auburn,	-	-	83	-	-	-	-	-	-	-	-	-	249 00
Avon,	-	10	-	-	-	-	12	-	-	-	-	-	9 90
Becket,	-	4	6	-	-	-	-	-	-	-	12	-	28 25
Bedford,	1	14	24	-	-	-	-	-	-	-	-	1[2]	249 67
Belchertown,	-	-	39	-	-	-	-	-	-	-	-	-	171 62
Bellingham,	-	16	20	-	-	-	6	-	-	8	-	1[1]	113 17
Berkley,	-	-	24	-	-	-	-	-	-	-	-	-	144 00
Berlin,	2	10	38	-	-	1	12	-	3	12	-	1[1]	241 45
Blandford,	-	1	16	-	-	-	-	-	-	-	-	-	59 80
Bolton,	-	14	12	-	-	-	6	-	-	6	-	-	58 40
Boxborough,	1	-	30	-	-	2	-	-	3	4	-	1[1]	180 46
Boxford,	-	-	16	-	-	-	-	-	-	-	-	-	45 60
Boylston,	-	-	24	-	-	-	-	-	-	-	-	-	76 20
Brimfield,	-	10	30	-	-	-	-	-	-	-	-	-	99 75
Burlington,	-	-	20	-	-	-	-	-	-	-	-	-	100 00
Carlisle,	2	15	18	-	2	-	6	-	1	6	-	1[2]	247 72
Charlton,	-	-	68	-	-	-	40	-	-	60	-	-	221 37
Chatham,	2	15	10	-	2	3	4	-	3	5	-	1[1]	152 98
Chesterfield,	-	-	25	-	-	-	-	-	-	-	-	-	75 00
Dana,	-	-	6	-	-	-	-	-	-	-	-	-	18 75
Dighton,	2	8	18	-	1	-	-	-	2	2	-	1[1]	108 67
Douglas,	-	25	50	-	-	-	-	-	-	-	-	-	175 00
Dunstable,	2	25	10	-	1	-	4	-	3	6	6	1[1]	106 14
East Longmeadow,	2	-	18	-	2	-	12	-	-	4	-	1[1]	149 71
Erving,	-	-	25	30	-	-	-	-	-	18	-	-	86 52
Freetown,	-	24	20	-	-	-	-	2	-	72	-	-	166 58
Georgetown,	-	20	36	-	-	-	-	-	6	12	-	-	134 83
Gill,	-	5	20	-	-	-	-	-	-	-	-	-	65 00
Goshen,	-	-	25	-	-	-	-	-	-	-	-	-	121 73

[1] One-horse. [2] Two-horse.

INVENTORY OF EQUIPMENT PURCHASED UNDER THE REIMBURSEMENT ACT — *Continued.*

Town.	Axes.	Cans.	Extinguishers.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wire Brooms.	Wagons.	Reimbursement.
Granby, . .	-	-	12	-	-	-	-	-	-	-	-	-	$39 00
Granville, . .	-	-	-	-	-	-	-	-	-	-	-	2[1]	130 00
Greenwich, . .	-	-	18	-	-	-	-	-	-	-	-	-	60 45
Groveland, . .	-	6	12	-	-	-	-	-	3	12	-	-	51 05
Hadley, . .	-	-	15	-	-	-	-	-	-	-	-	-	75 00
Halifax, . .	-	12	64	-	-	-	12	-	-	18	-	-	241 91
Hanson, . .	-	6	24	-	6	-	6	-	-	5	-	1[3]	250 00
Harvard, . .	2	7	14	-	2	3	-	-	3	12	-	1[2]	201 52
Holbrook, . .	-	12	10	-	-	-	-	-	-	-	-	-	69 00
Hubbardston, .	-	-	52	-	-	-	18	-	-	4	-	-	175 75
Leverett, . .	2	20	16	8	2	4	-	2	4	8	-	2[1]	160 17
Lunenburg, . .	2	12	10	-	2	3	4	-	3	5	-	1[1]	149 28
Lynnfield, . .	-	10	20	-	-	-	-	10	-	-	-	2[1]	246 25
Mashpee, . .	-	-	22	-	-	-	-	-	-	12	-	-	74 80
Mendon, . .	-	-	15	-	-	-	-	-	-	-	-	-	90 00
Merrimac, . .	-	-	15	-	-	-	-	-	-	-	-	-	75 00
Middleton, . .	-	-	16	-	-	-	-	-	-	-	-	-	49 50
Millis, . . .	-	-	8	-	-	-	-	-	-	-	-	1[2]	242 00
New Braintree, .	-	-	25	-	-	-	-	-	-	-	-	-	18 15
New Salem, . .	-	55	20	-	-	-	-	-	-	-	-	-	100 50
Newbury, . .	-	-	6	-	-	-	-	-	-	-	-	-	18 15
Norfolk, . .	-	-	18	-	-	-	-	-	-	-	-	-	99 00
North Reading, .	-	-	24	-	-	-	-	-	-	-	-	1[1]	248 43
Northborough, .	-	-	25	-	-	-	-	-	-	-	-	-	102 37
Norwell, . .	-	-	32	-	-	-	12	-	-	-	-	1[1]	243 87
Oakham, . .	-	12	24	-	1	1	2	-	3	3	-	1[1]	190 85
Otis, . . .	-	-	10	-	-	-	-	-	-	-	-	-	60 00
Paxton, . .	3	-	28	12	-	-	-	-	-	6	-	-	105 87
Pelham, . .	-	-	19	-	-	-	-	1	-	-	-	-	76 62
Pembroke, . .	-	-	31	-	-	-	60	-	-	-	-	1[2]	250 00
Petersham, . .	2	10	22	-	-	3	4	-	3	5	-	1[1]	202 55
Phillipston, . .	-	6	14	-	-	-	-	-	-	-	-	-	48 65
Plainville, . .	2	10	10	-	2	3	4	-	3	5	12	1[1]	183 50

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[1] One-horse. [2] Two-horse. [3] Motor truck.

INVENTORY OF EQUIPMENT PURCHASED UNDER THE REIMBURSEMENT ACT — *Continued.*

Town.	Axes.	Cans.	Extinguishers.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wire Brooms.	Wagons.	Reimbursement.
Plympton, . .	–	–	–	–	–	–	–	12	–	–	–	–	$20 93
Prescott, . .	–	–	10	–	–	–	–	–	–	–	–	–	48 16
Princeton, . .	–	32	80	–	–	–	–	–	–	–	–	–	249 20
Raynham, . .	3	46	30	–	6	–	12	–	9	15	–	3[1]	222 23
Rehoboth, . .	–	10	48	–	–	–	–	–	–	–	–	1[1]	250 00
Richmond, . .	–	15	25	–	–	–	4	–	–	–	–	–	86 20
Rochester, . .	–	24	60	–	–	–	–	–	–	30	–	–	205 37
Royalston, . .	3	10	22	30	2	2	12	–	–	42	–	1[1]	145 10
Russell, . .	–	7	39	–	–	–	–	–	–	–	–	1[1]	220 25
Rutland, . .	–	12	18	–	–	–	6	–	–	–	–	1[3]	250 00
Salisbury, . .	3	–	9	–	6	–	24	–	–	6	–	–	36 87
Sandwich, . .	22	12	36	–	–	2	–	–	–	24	–	1[1]	245 60
Shelburne, . .	–	–	50	–	–	–	–	–	12	6	–	1[1]	186 87
Shirley, . .	–	48	36	–	–	–	–	–	–	–	–	–	139 50
Shutesbury, . .	–	16	25	–	–	–	–	–	–	–	–	–	87 50
Southwick, . .	–	12	20	–	–	–	–	–	–	–	–	1[1]	82 00
Sterling, . .	–	–	25	–	–	–	–	–	–	–	18	1[2]	241 12
Stow, . . .	–	–	42	–	–	–	–	–	–	18	–	–	131 31
Sturbridge, . .	–	11	35	–	–	–	–	–	–	–	–	–	116 45
Sudbury, . .	–	–	40	–	–	–	–	–	–	–	–	–	250 00
Sutton, . . .	–	50	50	24	–	–	–	–	32	24	–	–	188 46
Tewksbury, . .	2	–	24	–	2	–	–	–	–	30	–	1[1]	174 00
Townsend, . .	–	–	46	–	–	–	–	–	–	–	–	–	250 00
Tyngsborough, .	–	120	20	–	–	–	–	30	12	24	–	–	189 80
Tyringham, . .	2	10	10	–	2	1	10	–	2	3	–	1[2]	112 30
Upton, . . .	–	–	30	–	–	–	–	–	–	–	12	1[1]	235 28
Wales, . . .	2	10	40	–	2	2	–	–	–	–	–	1[1]	236 77
Warwick, . .	–	6	10	–	–	–	–	–	–	–	–	1[1]	154 35
Washington, . .	–	–	4	–	–	–	–	–	–	–	–	–	20 00
Wendell, . .	–	–	8	–	–	–	–	–	–	12	–	–	35 07
West Boylston, .	–	–	107	–	–	–	–	–	–	–	–	–	250 00
West Bridgewater,	–	–	20	–	–	–	–	–	–	–	–	1[1]	200 12
West Brookfield, .	–	12	37	–	–	–	–	–	–	–	–	–	121 75

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[1] One-horse. [2] Two-horse. [3] Motor truck.

INVENTORY OF EQUIPMENT PURCHASED UNDER THE REIMBURSEMENT ACT — *Concluded.*

TOWN.	Area.	Cans.	Extinguishers.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wire Brooms.	Wagons.	Reimbursement.
Westhampton,	-	-	16	-	-	-	-	-	-	-	-	-	$48 00
Westminster,	-	52	48	24	-	-	24	-	-	24	-	-	242 22
West Newbury,	-	10	6	-	-	-	-	-	-	-	-	-	33 75
Wilbraham,	-	27	32	-	-	-	23	-	12	6	-	-	118 38
Wilmington,	-	12	40	-	1	-	-	18	-	34	-	-	187 38
Windsor,	-	-	30	-	-	-	-	-	-	-	-	-	150 00
Worthington,	2	15	10	-	-	3	-	-	-	5	-	1[1]	86 01
Wrentham,	-	12	12	-	4	-	-	-	-	-	-	1[1]	210 10
Totals,	69	1,001	2,711	128	50	33	355	82	122	619	72	45	$14,884 61

[1] One-horse.

TOWNS RECEIVING FIRE-EQUIPMENT REIMBURSEMENT DURING YEAR 1913.

Ashburnham,	$25 00
Ashfield,	99 00
Ashland,	34 04
Auburn,	39 00
Becket,	28 25
Belchertown,	100 00
Bellingham,	45 95
Boxborough,	90 46
Burlington,	100 00
Carlisle,	54 00
Chesterfield,	75 00
Dana,	18 75
Douglas,	175 00
Dunstable,	106 14
East Longmeadow,	149 71
Freetown,	94 86
Georgetown,	36 00
Goshen,	121 73
Granby,	39 00
Granville,	130 00
Halifax,	36 00
Hubbardston,	175 75
Leverett,	160 17
Lynnfield,	160 00
Mashpee,	40 25
Mendon,	90 00
Millis,	242 00
New Salem,	100 50
Norfolk,	99 00
North Reading,	114 00
Oakham,	52 85
Otis,	60 00
Paxton,	$105 87
Pembroke,	46 25
Plainville,	5 00
Plympton,	20 93
Richmond,	30 00
Rochester,	205 37
Royalston,	24 50
Russell,	220 25
Salisbury,	38 87
Shelburne,	182 50
Southwick,	82 00
Sterling,	9 37
Townsend,	250 00
Tyringham,	112 30
Upton,	106 75
Warwick,	154 35
Washington,	20 00
West Boylston,	250 00
West Brookfield,	121 75
Westhampton,	48 00
Worthington,	86 01
Total,	$5,012 48
Unexpended balance,	5 45
	$5,017 93
Appropriation,	$5,000 00
Credit by town of Wilbraham,	17 93
	$5,017 93

COMPARATIVE DAMAGES BY FOREST FIRES FOR THE PAST FIVE YEARS.

YEAR.	Number of Fires.	Acreage burned.	Cost to extinguish.	Damage.	Average Acreage per Fire.	Average Damage per Fire.
1909, ...	1,496	35,083	-	$189,482	23.45	$126 66
1910, ...	1,385	42,221	$23,475	205,383	30.46	148 29
1911, ...	2,536	99,693	47,093	537,749	39.31	226 24
1912, ...	1,851	22,072	20,219	80,834	11.92	43 67
1913, ...	2,688	53,826	35,456	178,357	20.02	66 35

FOREST FIRES OF 1913.

MONTHS.	Acres.	Damage.	Cost to extinguish.	Number.
1912.				
December, ...	731	$281	$354	93
1913.				
January, ...	43	15	44	21
February, ...	62	57	118	38
March, ...	1,351	2,896	1,133	317
April, ...	8,385	14,525	5,686	580
May, ...	21,325	93,345	9,878	684
June, ...	5,092	25,894	2,835	255
July, ...	14,113	35,050	9,915	345
August, ...	2,025	5,586	4,684	250
September, ...	388	390	501	38
October, ...	83	34	84	9
November, ...	228	284	224	58
	53,826	$178,357	$35,456	2,688

COMPARATIVE CAUSES OF FOREST FIRES FOR THE PAST THREE YEARS.

CAUSES.	1911.		1912.		1913.	
	Number.	Per Cent.	Number.	Per Cent.	Number.	Per Cent.
Unknown, ...	1,128	44.5	649	35.1	650	24.2
Railroad, ...	685	27.0	640	34.6	913	34.0
Burning brush, ...	135	5.3	93	5.0	148	5.5
Smokers, hunters, berry pickers, .	158	6.2	223	12.0	386	14.3
Steam sawmills, ...	3	.1	8	.4	6	.2
Children, ...	118	4.7	79	4.3	109	4.1
Miscellaneous, ...	309	12.2	159	8.6	476	17.7
Totals, ...	2,536	100.0	1,851	100.0	2,688	100.0

PRECIPITATION IN INCHES FOR THE YEARS 1911, 1912 AND 1913, WITH DECEMBER OF PREVIOUS YEAR.

MONTHS.	1911.	1912.	1913.	Normal.
December,	3.24	2.59	5.73	3.74
January,	3.07	3.87	3.21	4.12
February,	3.20	2.24	3.77	3.97
March,	3.27	5.26	5.32	4.34
April,	2.86	4.05	4.73	3.46
May,	.89	4.03	2.85	3.37
June,	4.76	.53	3.20	3.07
July,	4.55	4.16	2.00	3.65
August,	6.70	3.85	3.30	3.70
September,	3.36	1.71	2.77	4.36
October,	3.01	1.52	7.62	4.13
November,	5.71	3.45	2.70	3.96
Totals,	44.62	37.26	47.20	45.87

In addition to our town forest wardens we have 1,740 deputy wardens, 1,205 of whom have telephone connection with our observation towers. We desire to have at least 6 deputies in each town located in different places throughout the forest area.

The permit law, which has been in operation for the past three years, has given general satisfaction. There are still a few towns that have not accepted the act which we hope will take advantage of it at their next town meeting. Nearly 17,000 permits have been issued, with no serious fires resulting from them. The comparative table on page 41 shows acreage burned, cost to extinguish and damage caused. While this table shows an increase in damage, it also shows that we have had 837 more fires than last year and 156 more than in 1911, when our loss was $537,749.

Early in the season 12,000 cloth and cardboard notices, calling attention to the fire losses in previous years and quoting extracts from the forest-fire law, were posted conspicuously in every town in the State. In spite of this we have had 19 prosecutions, 14 of which resulted in convictions for violations of the forest law.

Exceptionally good results have been accomplished by our observation stations this year. With a drouth lasting nearly eight weeks throughout eastern Massachusetts, including the dry and sandy Cape country, and with a record of over 3,000 fires reported by the observers, our records show only 6 serious fires which were allowed to burn some days without extinguishment. A careful investigation of these 6 fires has revealed in each case the presence of one or more of three common causes, namely, inefficiency in the town forest fire organization, lack of proper forest fire fighting equipment, and indifference on the part of the general public until such time as the fire assumed sufficient proportions to threaten their villages and homes. I do not wish to give the impression that this is the state of affairs in every town, but I must admit that it has been found to be the condition in several instances where serious fires have occurred, and until these conditions can be remedied, or this department vested with authority, equipment and funds so that we may be in a position to assume full responsibility, just so long shall we have serious fires and unnecessary damages. It is of the greatest importance that some system be adopted whereby this department can be of assistance to the various towns in handling their more dangerous fires. We should be supplied with at least two motor trucks equipped with modern forest fire apparatus and capable of carrying from 10 to 15 men trained in forest-fire work. These trucks should be placed under the supervision of the district forest wardens and located, one in the Cape country and one in the central part of the State. Nearly every serious fire has been practically extinguished the first day, but for various reasons was allowed to start anew the second day and was beyond control before night. It is on such occasions as these that we need men trained in this line of work with sufficient equipment to handle large fires, together with some method of quick transportation to enable them to get to the fire promptly. With automobile trucks located as above we would be able to reach any fire throughout the eastern part of the State within two or three hours.

Respectfully submitted,

M. C. HUTCHINS,
State Fire Warden.

GYPSY AND BROWN-TAIL MOTH WORK.

The conditions of this work were discussed quite fully in last year's report by the writer. One year's time has not very materially changed them, generally speaking; nevertheless, I am frank to say that this work has never been more thoroughly comprehensive and better prosecuted than at the present time. Our organization is smaller, the men are giving greater study to the problems and more real work of a permanent nature is being done. The State Forester has constantly endeavored to impress the importance of making the moth work practical and self-supporting wherever and whenever possible. The local moth superintendents in our cities and towns are yearly acquitting themselves as men in whom confidence and public trust may be placed. When this work was first placed under my charge the constant yearly changes in the personnel of the local superintendents, due to various causes, resulted in much of the adverse criticism so common at that time. It has not been a pleasant duty to be compelled to differ with town authorities now and then, but it is fair to say that these differences are in these later days amicably adjusted, as there is a better and more wholesome understanding of the aims and purposes of the work.

It was due to the confidence in and ability of the local moth superintendents in our various cities and towns that it was possible to dispense with the office of inspector in this department during the present year. A few years ago it was necessary to have a force of 54 men in the general supervision of the moth work; this same work is now carried on by 15 men. Better equipment and modern transportation facilities, together with experienced superintendents already alluded to, have made this possible.

Fifty more high-power sprayers were purchased by cities, towns and private parties last spring. These, together with the equipment already on hand, have increased our efficiency very much. As has been emphasized heretofore it is necessary to have tools to work with to get work done. Occasionally a town finds it easier to contract its work out rather than go to the expense of equipment of its own, but invariably it pays out more and gets less done. A local superintendent who has a power sprayer feels it incumbent upon him to properly care for the public trees, while invariably citizens apply to him to have their private estates sprayed. This private work pays for itself and indirectly is of equal benefit to the town or city, besides giving employment to labor for a longer period, which guarantees a better quality.

It is estimated that fully 500 tons of arsenate of lead were used during the season.

At stripping time each of the division men made a careful survey of the forest lands thus infested, and submitted a list to the office, — the number of acres stripped, their location, together with the owner's address. Later printed notices were sent to each of the property holders offering advice. This information has resulted in splendid co-operation, and much practical work is now under way.

The division men are endeavoring to get some real object-lessons established in their respective territories which, once accomplished, will serve an excellent purpose by way of instruction.

The parasites and the two diseases used in suppression work are certainly pleasing factors and give great encouragement. (See Dr. L. O. Howard's report on parasites and their work which is printed elsewhere.) The diseases are thoroughly established and are extremely effective.

The United States government is concentrating its energies on holding the spread, and therefore this perplexing problem is in good hands. A belt across the State, three towns' wide, has been taken over by them, and every precaution is being exercised to hold the ground from further advance. This department is increasing its work in the towns next to those the government is caring for. Most of these towns have relatively low valuations and are largely wooded, and hence are unable to cope with the situation alone. Our strategic points now are to maintain our present ground and, through better methods and the assistance of diseases, parasites and forestry practices, eventually to hold them under subjection. It is no time, however, for us to lessen our earnestness. The government, State and town forces are all working harmoniously together, and it is believed each year will show improved conditions.

Private Property Work and the Moth Superintendent.

The effective work accomplished by local moth superintendents last year on private property which is self-supporting has continued in increasing interest and public approval. The ideal town is one with a hustling, broad-minded moth superintendent, who is given full charge of the care of the trees and in whom everybody has confidence. Such an official should be employed by the year and his whole time given to the work. If the office of tree warden were an appointive one, the combination of the two positions would be ideal; here is one of our present difficulties, but in time this problem will settle itself. The position of city forester solves the question for the cities.

The moth superintendent, through the opportunities offered on private property, can plan his work accordingly and enlarge his usefulness to the town. The more private work there is the greater the opportunity to employ labor and hence to secure an active force of permanent men.

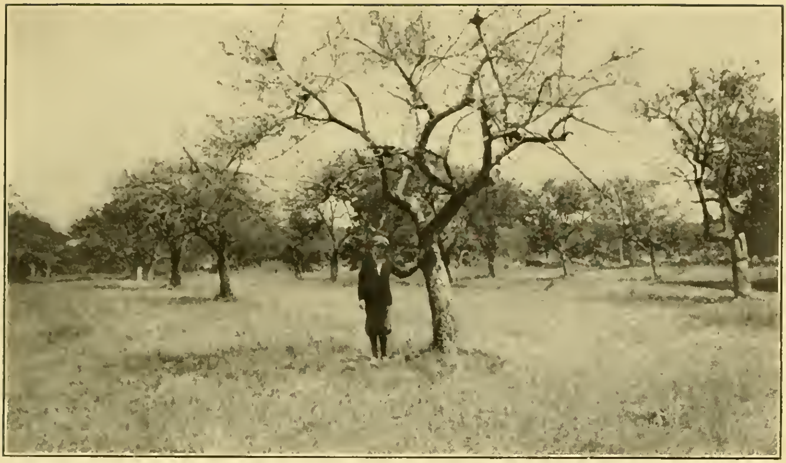
It does not follow that just because the moth work is fixed by law, a man selected to take charge of it cannot engage in other equally beneficial undertakings to improve and care for the trees and shrubs of his town. There is no reason why a superintendent should not do other work on private property, such as pruning and spraying for other insects, provided the work is self-supporting. The amount of private work is yearly increasing in our towns and cities, and this is indicative of better results generally and an activity that savors of better conditions in the future.

The Tent Caterpillar.

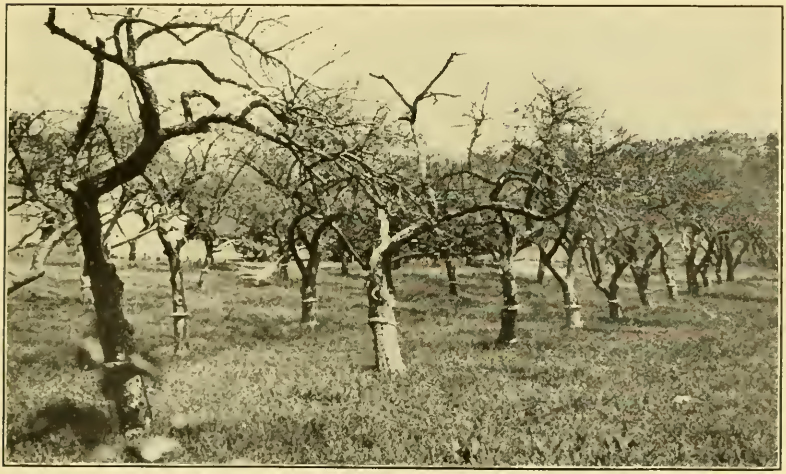
One of our native insect pests which is the cause of great annoyance and damage to the farmers of Massachusetts is the common apple tree tent caterpillar.

Nearly every year it is found in more or less abundance in various sections of the State, and the past two seasons have witnessed serious outbreaks of the insect. Its favorite food is the wild cherry, which is found growing along roadsides and stone walls which serve as breeding places for it. The tent caterpillar is easily recognized, owing to its habit of building a conspicuous nest in the fork of a limb which provides a shelter for it during stormy weather.

From these tent-like homes the caterpillars emerge during pleasant days and feed on the foliage of the tree. The adult of this insect is a reddish-brown moth with light-gray markings. It is flying about from the middle to the latter part of the summer, and the female moth deposits her eggs in a compact, dark-colored mass, usually entirely encircling a twig of the tree. In this stage of its life-history it remains during the winter, the eggs hatching the following spring. As soon as hatched the little hairy caterpillars begin feeding on the buds. At this time they begin the construction of the tent or nest in a near-by fork. As the foliage develops, the caterpillars feed on it, growing all the time. The caterpillar attains maturity about the 1st of July. Fully grown, the caterpillar is nearly 2 inches long. The general color of its body is black with a



A neglected orchard in the country. Orchards of this type are a menace to the surrounding country. They are non-productive and act only as breeding places for depredations of all kinds. They should be properly cared for or destroyed. This orchard not only was infested with tent caterpillar, as shown, but abounded with a mixture of insects and diseases. Mandatory legislation is the only effective remedy.



A neglected city orchard. Real estate has gone up in value and this property is being held as a waiting investment. These trees are neglected, and constitute a menace to the surrounding country. The land for house lots would be just as valuable without them, and why not give them away for the wood. Enough obnoxious insects are bred here to destroy shade, fruit and forest trees all about it. This should not be allowed.

white stripe running the entire length of its back, and on each side may be seen a row of blue spots. Soon after reaching maturity the caterpillars leave the tree, and finding suitable shelter, transform to the pupa stage. There is but one generation of this insect a year.

The tent caterpillar is not difficult to control, and may be easily suppressed by spraying the trees with arsenate of lead, using 4 or 5 pounds to 50 gallons of water. Other methods are employed to destroy the caterpillars, such as burning them with a torch when they have collected on the nest during cool or cloudy weather. Care should be exercised in the use of a burning torch, however, as the tree may be seriously injured by burning the branches.

Another insect found in Massachusetts closely related to the apple tree tent caterpillar is the forest tent caterpillar. This caterpillar may be distinguished from the ordinary tent caterpillar described above by the fact that it has a pale blue head, and instead of the white stripe which marks the other species its back shows a row of white diamond-shaped spots. Its life-history is very similar to that of the common tent caterpillar, although it does not build a nest of any kind. As its name indicates, this insect is essentially a forest pest, although it attacks both shade and orchard trees.

Fortunately, it is held in check by natural enemies in the form of parasites and diseases, but if serious outbreaks occur the insect may be controlled by spraying with arsenate of lead, as in the case of other leaf-eating insects.

Benefits to come from Birds.

The conservation of bird life is a worthy problem, and our ornithologists and naturalists generally are rightfully solicitous for their propagation and protection. Occasionally a person gets it into his mind that this department disregards bird life in our operations. Nothing could be a greater mistake. When the effect of arsenical spraying and bird life was aired in the press a few years since, the State Forester took the matter up with Mr. Forbush, the State Ornithologist, and some definite co-operative experiments were carried on in which Mr. Forbush exonerated the spraying.

During the past two years splendid interest has been manifested in preserving bird life here in Massachusetts. Already town bird wardens have been appointed in a few towns. Bird sanctuaries, feeding grounds, covers for protection, houses, etc., are all receiving attention. This department is in perfect accord with all of this work, and further observation and recognition of assisting bird life will be given more consideration the coming season than ever. An interesting paper was presented by Mr. Wm. P. Wharton, before the Massachusetts Forestry Association at the annual meeting, which pointed out some observations he made abroad during the past summer. Some experiments along the suggestions made by Mr. Wharton may be put into operation here the coming year. There is every reason to believe that much good can be accomplished through enlisting the forest wardens and the local moth superintendents more actively in this work. These men are already town officials, and will gladly assist in every way.

Another season I shall hope to go into this whole matter more in detail. It is not a question simply of the effect of bird life upon the moth problem alone that the department of the State Forester is interested in, but one which affects all forest and shade-tree pests.

Work on State Highways.

This department assisted the State Highway Commission to the extent of looking after the spraying of the highways throughout the moth-infested section of the State. The spraying for the elm-leaf beetle was included in this work. Where we are able to use a traveling sprayer the work accomplished is satisfactory, but it is necessary to arrange with towns to do the work in many cases with varying results, since the town equipments for doing the work are widely different. With such a mileage of State roads it would seem an economical expenditure were the State prepared to do this work through the use of modern auto truck sprayers. Besides being very effective during the spraying season they could be used for planting work, removing brush, etc., at other seasons of the year.

Work was done in the following cities and towns on the State highways, and paid for by the Highway Commission: —

State Highway Bills, 1913.

Acton,	$41 25
	109 76
Amesbury,	13 59
	15 75
Andover,	31 50
	48 51
Ashburnham,	39 50
Ashby,	49 13
Ashland,	19 50
	45 82
Attleborough,	16 50
	43 12
Barnstable,	10 00
	395 00
Barre,	19 00
Bedford,	35 19
	32 10
Bellingham,	13 10
Beverly,	115 03
	39 45
Billerica,	29 00
	36 00
Boxborough,	59 00
	63 75
Brewster,	30 00
Bridgewater,	31 40
Burlington,	126 50
	34 00
	67 70
Chelmsford,	43 13
	55 30
Cohasset,	20 40
	13 28
Concord,	51 11
	46 78
	99 13
Dennis,	6 00
Dighton,	93 77
Dover,	30 94
Dracut,	42 00
	21 32
Duxbury,	16 00
Falmouth,	70 55
Fitchburg,	51 95
	25 44
Foxborough,	8 00
	87 00
Framingham,	78 25
	29 92
Franklin,	18 50
	26 50
	6 50
Grafton,	$15 75
	28 10
Groton,	24 08
	15 70
Groveland,	25 74
	22 87
Hamilton,	38 70
	7 75
Haverhill,	82 71
	70 82
Harvard,	22 92
	21 90
Hingham,	27 60
	46 50
Holbrook,	10 50
Holliston,	10 00
Hudson,	34 87
	7 76
Ipswich,	19 50
	28 50
Lakeville,	3 50
	42 77
Lancaster,	37 20
	14 98
Leominster,	7 81
Lexington,	94 50
	16 32
	3 69
	22 95
Lincoln,	14 63
	47 00
Littleton,	17 00
	57 78
Lowell,	17 85
	23 19
Lunenburg,	30 24
	11 85
Marlborough,	144 20
	96 91
Marshfield,	28 50
Melrose,	9 60
	22 20
Merrimac,	18 96
	10 69
Methuen,	38 25
	48 43
Middleborough,	29 03
Millbury,	6 15
	4 47
Milton,	1 98
Natick,	13 22
	34 85

State Highway Bills, 1913 — *Concluded.*

Needham,	$30 65
	27 53
	9 96
Newbury,	51 64
	23 71
Newburyport,	22 95
	13 64
North Andover,	92 40
	56 25
North Attleborough,	64 05
North Reading,	14 00
	23 75
Northborough,	101 50
	26 60
Norton,	11 00
	32 75
Norwood,	5 50
	62 10
Pepperell,	37 50
	27 25
Quincy,	10 00
Reading,	63 00
	92 00
Rockland,	20 00
	68 75
Rowley,	49 80
	53 32
Salisbury,	43 19
	41 65
Sandwich,	21 00
Scituate,	55 20
	79 70
Shrewsbury,	26 10
Somerset,	110 37
Southborough,	29 75
	29 40
Sterling,	65 08
	22 00
Stoneham,	33 70
	82 74
Sudbury,	162 40
	92 80
Sutton,	8 00
Swampscott,	5 00
Swansea,	$127 75
Taunton,	5 40
	30 39
Templeton,	7 50
Tewksbury,	43 60
	61 58
Townsend,	162 37
	47 00
	64 80
Tyngsborough,	41 50
	93 25
Wayland,	50 75
	47 98
Wellfleet,	30 00
Wenham,	56 25
	38 50
West Boylston,	39 38
West Bridgewater,	9 00
	4 68
West Newbury,	54 22
	43 66
Westborough,	21 00
	8 70
Westford,	56 00
	64 00
Westminster,	7 50
Weston,	58 50
	44 50
Westwood,	16 50
Weymouth,	30 00
	95 81
Wilmington,	24 95
	50 17
Winchester,	50 80
	48 15
Woburn,	27 00
	61 50
	13 19
	91 98
Worcester,	15 68
	$7,930 06
Credit by balance,	369 94
Total appropriation,	$8,300 00

PARASITE WORK.

REPORT OF DR. L. O. HOWARD, CHIEF OF THE BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY, WASHINGTON, D. C., Dec. 20, 1913.

Prof. F. W. RANE, *State Forester, Boston, Mass.*

DEAR PROFESSOR RANE: — In accordance with your request, I take pleasure in submitting a brief report upon what has happened to the imported parasites of the gypsy moth and the brown-tail moth during the year.

Yours very truly,

L. O. HOWARD,
Chief of Bureau.

The work on parasites and predatory enemies of the gypsy moth and brown-tail moth has continued along the same lines as during the previous year, except that no attempt has been made to import additional parasites this season. The material imported from Europe last year has been colonized, and an effort has been made to determine the extent to which the species secured have established themselves in the field.

Owing to the fact that one of the imported egg-parasites of the gypsy moth, *Anastatus bifasciatus*, breeds very slowly, extensive collections were made during the last winter of parasitized gypsy moth egg-clusters from colonies that were planted in previous years. From this material it has been possible to liberate 1,500,000 parasites of this species, and these have been placed in 1,500 colonies in sections where the insect had not become established. Eight hundred colonies were planted in towns along the western border of infestation, and the balance was liberated in a number of towns in the northern part of Massachusetts. During November of this year collections were made in New Hampshire, in the colonies of Anastatus that were planted a year ago, and examination showed that these plantings were practically all successful, although the spread has been slow. From these collections about 100,000 parasitized eggs were secured and will be used for colonization in New Hampshire next spring.

Investigations have shown that another egg-parasite of the gypsy moth, namely *Schedius kuvanae*, has become perfectly established in several colonies where it had previously been planted. During the past year there has been a decided increase in the abundance of this parasite, and in some cases it has spread nearly a mile and a half from the limits of its last year's spread.

The parasites attacking the caterpillars of the gypsy moth have been found more abundantly than during the previous year. *Compsilura* *concinnata*, a species of Tachinid fly, was very abundant during the summer of 1912, especially in the territory which was longest infested by the gypsy moth, and continued to spread during the past summer. It has not been so abundant in the oldest infested territories as in some of the outlying colonies. Collections of more than 1,100 gypsy moth caterpillars made in 4 towns in central Massachusetts show a parasitism by this species of over 40 per cent, while similar collections in the central infested area have indicated an average parasitism of about 5 per cent. It is probable that the decrease in parasitism in the old infested area, as far as this species is concerned, is due to the fact that gypsy moth caterpillars are not nearly as abundant as they were during the previous year, and also because of the enormous numbers of the American tent and forest tent caterpillars which were present in this region and which are also attacked by this parasite.

Limnerium disparidis and *Apanteles* species were received from Europe for the first time in 1911, and were planted in several badly infested gypsy moth colonies. Both species were recovered during the summer of 1912, which indicated that it is possible for the insects to withstand our cold winters. In the case of the latter species, as high as 7 per cent of parasitism of gypsy moth larvæ was found. The present summer the Limnerium was recovered from a single locality where the species was liberated in 1911. Although it has evidently become established, it has not thus far shown marked ability to increase in the gypsy moth infested area in New England.

Another species of Apanteles, namely, *A. lacteicolor*, an important parasite of the brown-tail moth caterpillars, has been recovered in large numbers, and has been found to attack gypsy moth caterpillars in widely separated regions. This species seems to be multiplying more rapidly than any of the other Hymenopterous parasites of the gypsy moth. In order to colonize this species over as wide an area as possible, an arrangement was made with the State Entomologist in New Hampshire, and the superintendent of moth work in Maine, to liberate as many colonies as possible along the outskirts of the area infested by the brown-tail moth in those States. Small collections of gypsy moth larvæ were made at Melrose, and in some cases 10 per cent of the larvæ were killed by this species. In several localities in New Hampshire the past summer the cocoons of this parasite were very abundant, and several hundred were easily collected for experimental work. They were taken, for the most part, on the foliage of trees, and attached to dead caterpillars.

The Calosoma beetle (*Calosoma sycophanta*) has been observed in large numbers in towns where bad colonies of the gypsy moth were present. It has not been possible to obtain definite records of the amount of benefit derived from this species, or of its abundance, except in cases where trees were burlapped, as these bands furnish favorable hiding places for the caterpillars and are favorite locations for the beetles and larvæ to obtain food. In such cases, where caterpillars were abundant, 20 or more of the Calosoma larvæ have frequently been found under a single burlap band on an average-sized tree. As they feed upon the pupæ as well as upon the caterpillars, the amount of benefit derived is very great, although it is difficult to figure the percentage of larvæ killed.

From collections made during the winter of 1912–13 it was determined that *Monodontomerus aereus* has spread over practically the entire territory now known to be infested by the brown-tail moth. It was not found in as large numbers as during the previous year. *Pteromalus egregius* has been found widely scattered over the area infested by the brown-tail moth, and its numbers are slowly increasing, judging from the records that have been secured from sample collections.

There is thus no doubt that a number of the imported species are thoroughly established, and that they are increasing each year, and, further, that many hundreds of thousands of caterpillars were killed by them during the past summer.

The Wilt Disease or "Flacherie."

The experimental work with this disease has been carried on almost wholly during the past season under the direction of Dr. W. M. Wheeler of the Bussey Institution of Harvard University and Dr. L. O. Howard, division of entomology, United States Department of Agriculture. The results of this work will be reported on later. The disease itself is found spread generally throughout the moth-infested territory, and is proving a great factor in the control of the gypsy moth. It is to be hoped that through the studies by experts discoveries may be made whereby this disease can be even further made use of in the work of suppression.

The Fungous Disease of the Brown-tail Moth.

The work of propagating and disseminating this disease was undertaken and carried out under the usual co-operation with Harvard University. The work of the previous season having been so successful it was thought we could not help getting results from our ripened experience. We had plenty of caterpillars to work with, but, unfortunately, try as we might, the spores could not be secured to produce the results wanted. The cool season, we believe, had most to do with it. Later on in the year, however, a number of places were found where the wilt disease occurred in nature and was extremely effective. We are not discouraged, however, and hope to regain our ground in producing the disease on a large scale for general distribution the coming spring. One thing is perfectly sure and that is, this disease is extremely effective in destroying the brown-tail moth larvæ.

NORTH SHORE WORK.

The usual co-operative work on the North Shore between the summer residents committees, the towns and the State Forester's department, has been carried on again the past season.

If those who are in touch with this work should be consulted, it is believed that the universal verdict would be that the season has been a most successful one. Through his continued splendid co-operation, this department feels especially indebted to Col. Wm. D. Sohier for making it possible to demonstrate what can be accomplished under favorable environment. The North Shore work is beginning to radiate its effect elsewhere.

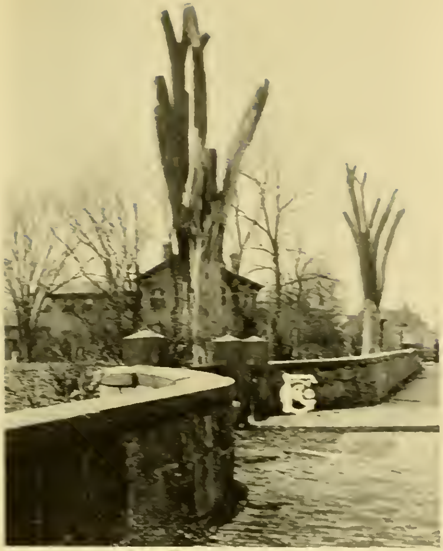
The following is a reproduction of the financial statement of the summer residents committees' report that relates to the moth and forestry work: —

DETAILS OF THE COST OF THE WORK FROM JULY TO JULY.

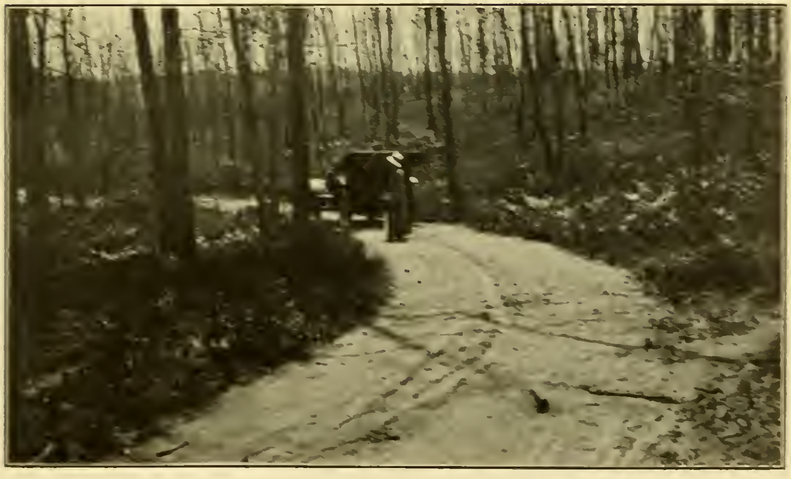
Spraying 3,610 acres,	$19,973 43
Cutting and burning 407 acres,	6,919 33
Creosoting 2,871 acres,	4,040 57
Tanglefooting,	35 57
Leopard moth work,	192 11
Spraying for aphids,	20 21
Road repairing, 7,925 square feet,	92 80
Tool repairing,	851 69
Repairs on shop,	343 00
Repairs on engines,	1,019 07
Experimental work,	12 00
	$33,499 78

AVERAGE COST OF WORK.

Spraying per acre,	$5 53
Cutting and burning per acre,	17 00
Creosoting per acre,	1 41



A view of some of the old trunks of elms which have died from neglect in spraying. From a business standpoint these trees could have been sprayed yearly for the interest upon the cost of removing them. Estates losing large trees like these also invariably greatly depreciate in value. It is, therefore, good business for municipalities and individuals to spray and care for their trees.



A deciduous forest at Concord entirely defoliated by the forest tent caterpillar. This photograph was taken by the State Forester on July 3. This insect, it is predicted, will be very destructive the coming spring. Spraying with arsenate of lead, as for moths, will control it.

Lectures and Addresses.

The State Forester has been called upon for a large number of engagements throughout the year. As much of this work has been done as time would permit. Mr. C. O. Bailey and Mr. H. O. Cook have assisted in this work. Mr. R. G. Pierce, the expert on the chestnut bark disease, has in addition to those listed made quite a campaign throughout the State where the chestnut is indigenous.

Now that the Massachusetts Agricultural College has a department of forestry, the lectures heretofore given by the State Forester have not been necessary, and the past season the lectures were confined to the subject of State forest policy.

The following organizations were addressed during the year: —

Brewster Village Improvement Society.
Essex County Pomona Grange.
Russell State Grange Field Meeting.
Middlefield Highland Agricultural Society.
Acton State Grange Field Meeting.
Concord Men's Club.
Cohasset Men's Club.
Stoughton Board of Trade.
Wareham Men's Club.
Hale Club, Boston.
Fitchburg Forestry Association.
Paxton Grange.
West Brookfield Field Meeting, State Grange.
Fall River Chamber of Commerce.
Watertown Men's Club.
Bristol County Fair.
Holden Farmers' and Mechanics' Association.
University of Syracuse, Syracuse, N. Y.
Men's Club, Newton Center.
Paper Makers' Association, Boston.
Town of Dover, Town Hall.
Quinquebog Historical Society, Southbridge.
Hyde Park Village Improvement Association.
Borough Pomona Grange, Berlin.
New Bedford Forestry Association.
New Bedford High School.
Pomona Grange at Medfield.
Massachusetts Agricultural College.
Association of Tree Wardens and Foresters, Amherst.
Rural Club.
Amesbury Village Improvement Association.
Wellesley Village Improvement Association.
East Freetown Grange.
Men's Club of Congregational Church, Arlington.
Milton Woman's Club.
Bridgeport Club, Conn.
Smith College.
East Bridgewater Men's Club.
Public Meeting, town of Hubbardston.
Springfield Forestry Association.
Leominster Forestry Association
Twentieth Century Club.
Jamaica Plain Men's Club.
Business Men's Association and Natural History Club, Plymouth.
State Grange Field Day, Colrain.
Royalston Improvement Association.
State Grange Field Day, Springfield.
State Grange Field Day, Orange.
Massachusetts Tree Wardens' and Foresters' Association, Boston.
Massachusetts State Firemen's Association.
Nantucket Civic League.
Fire Prevention Association, Philadelphia.
Public meeting, City Hall, Dedham.
Society for the Promotion of Agricultural Science.
Massachusetts State Grange.
Hyannis Woman's Club.
State Normal School, Hyannis.
Avon Club. Winchendon.

Field Meetings of the State Grange.

The field meetings of the State Grange that have been held during the summer months for the past two years in various parts of the State have been exceptionally interesting, and without doubt have served to stimulate the interest of our farmers in all the movements that have been inaugurated in the interest of rural progress.

While the discussions at these meetings covered many fields of public endeavor, it was gratifying to note the deep interest that was manifested in the talks given on forestry by State Forester F. W. Rane and Sec. C. O. Bailey, who were speakers at several of these meetings.

The Society for the Promotion of Agricultural Science convened at Washington, D. C., November 11, and the Massachusetts State Forester delivered the following paper before said society: —

What Massachusetts has accomplished for Science in her Fight against the Gypsy and Brown-tail Moths.

The pages of universal history may be scanned in vain for a record of a war between nations which has not resulted in new inventions or discoveries that have served to advance civilization, — discoveries that were made possible by the exigencies of the times. This progressive knowledge has become the bulwark of the development and stability of the nations of the earth. In her war against the gypsy and brown-tail moths, the experience of Massachusetts has not been at variance with past history.

Throughout the long and costly struggle to save our forest and shade trees from being completely destroyed by these voracious insects, inventive minds, as in other wars, have been studiously engaged in developing better and more destructive methods of warfare, from which a permanent addition to science has resulted.

The Commonwealth of Massachusetts has placed all science in its debt by the interesting and successful experiments which it has carried on in the importing and breeding of parasites and other natural enemies which prey on the gypsy moth and the brown-tail moth. This work was inaugurated on a large scale in co-operation with the United States Department of Entomology in 1905, shortly after the Commonwealth had for the second time undertaken to suppress these two insects. The work has been attended with a large measure of success, and during its prosecution various interesting scientific discoveries have been made in regard to these insects and their life-history, and also in regard to the life-history of their various parasites and related insects.

The importation of the Calosoma beetle (*Calosoma sycophanta*) from Europe to destroy the gypsy moth has resulted in much practical and interesting data in regard to the beetle and its habits. It is a pronounced success.

The construction and equipment of the laboratory where the work has been carried on has attracted the attention of the scientists all over the world, and in the year 1907 several eminent scientists from this country, Europe, Africa and Australia visited the parasitic laboratory, which was then at Saugus, Mass. None of these men could suggest improvements in the methods used, but they all found many to admire and some to copy in their own countries where similar lines of investigation were being inaugurated.

Much experimenting has been carried on, also, with the fungous disease of the brown-tail moth and with the so-called wilt disease, or "flacherie," which attacks and destroys the gypsy moth to a large extent.

The development of spraying machines and insecticides makes one of the most striking and important chapters in the history of the moth-suppression campaign. The necessity for an insecticide possessing superior adhesive qualities, at the same time containing sufficient poisonous properties to destroy the caterpillars, was early recognized. Spraying with common arsenical poisons, such as Paris green, London purple, etc., had been in use for many years, but with indifferent success. When it became evident that these insecticides were not accomplishing the work desired, an effort was made to discover a more effective poison, and much time and labor were spent in this undertaking. Some of the best chemists obtainable were employed by the State and put on this experimental work, which resulted in the production of arsenate of lead.

This work was carried on in the year 1893. Since then the use of this material has increased by leaps and bounds, until at the present time the manufacturers of this article are shipping it to all parts of the world. Thus to Massachusetts moth work the agricultural world owes an everlasting debt of gratitude for her persistent and successful endeavors along this line. The results of the untiring efforts of the Massachusetts Forestry Department in developing improved spraying machines, hose couplings, nozzles and other apparatus of this nature have completely revolutionized this industry, and present a record of accomplishment in this line never before equalled.

By improved machinery in spraying we are now able to spray woodlands at about $6 an acre, while formerly the expense was $40 or more. The work, as well, is far more thoroughly done. While this improved spraying machinery is highly appreciated in the moth-infested country of New England at present, it will take time for others to recognize its merits, until the use of similar machines is demanded elsewhere. When the elm-leaf beetle and similar insects and diseases begin affecting tall trees elsewhere, which is inevitable in the future, then I am confident the results of our Massachusetts inventions will be appreciated. Already the cities of Washington, Baltimore and Albany are using these high-power tree sprayers and others are bound to follow.

By being able to throw a stream over the tallest of our shade trees from the ground, and hence eliminating the cost of climbing, not only is the great expense of labor overcome, but a whole street can be sprayed during the same length of time formerly required for the treatment of but a few trees. Our latest device is to substitute auto trucks for horses in our highway, shade-tree, park and city work which is proving very satisfactory. The same power that drives the auto also does the spraying.

With our present spraying equipment of all kinds in Massachusetts alone, I believe we use in a single season nearly 1,000 tons of arsenate of lead. The State Forester's contract for lead the past year was 500 tons.

One would hardly expect that such a pest as the gypsy moth would be an aid to the introduction of forestry methods in the treatment of our woodlands. Rather, one would expect it to be the reverse, but such is not the case.

When the office for the suppression of the gypsy moth and that of the State Forester were united in 1908, the writer strongly advocated that forest thinnings and improvement cuttings would be of great assistance in combating the depredations of this pest. He argued that not only would the woodlands be in a better physiological condition for having the weakened and suppressed trees removed, and hence better able to stand the stripping of the caterpillars, but in addition the operations of hand suppression and spraying could be more cheaply performed because the superfluous trees would be taken out. Such cuttings thereafter as were made directly by the department were supervised by trained foresters, and at the same time he urged municipalities and private owners to do as much of this work as possible and to make use of his assistants.

Within the past year or two scientific facts have come to light which vastly add to the importance of modern forestry practice as a control to the gypsy moth. Mr. Burgess, an entomologist of the United States Bureau of Entomology, who was doing co-operative work with the Massachusetts State Forester, in studying the feeding habits of the gypsy moth in the laboratory and the field, found that this insect is by no means the omnivorous feeder that it is commonly supposed to be; that although it does eat the leaves of a large variety of trees, it actually thrives best on only a few, and that if deprived of this favorite food entirely, soon succumbs to parasitic enemies.

These experiments of Mr. Burgess were supplemented by some observations of Mr. Fiske, another co-operating government entomologist, made in Europe. Mr. Fiske returned to this country last year convinced that the *chief* reason for the comparative harmlessness of this insect in that continent is due to the better silvicultural condition of the European forests. This silvicultural condition has been brought about by centuries of forestry practice. In addition, as already observed in Massachusetts with white pine, its freedom from the pest in clear stands proved also true of all coniferous growth abroad, especially in Germany, because the conifers are all highly resistant trees. The writer, after a study of these conditions in Europe in the summer of 1912, returned with even greater conviction that forestry management can be made a great factor in moth control. Under proper conditions we too should have a much larger percentage of coniferous growth, but unscientific lumbering and forest fires have conspired to reduce it to a minimum.

These discoveries have molded beautifully into the Massachusetts State Forester's methods of management, and offer a wide field for forestry development. Our woodlands should be thinned and the favorable trees, notably the oaks and birches, removed. Where there is little chance of resistant species taking the place of those cut out, artificial reforestation must be resorted to. Such operations must in time result in the removal of a large share of our scrubby oak woodlands and their replacement by fine plantations of conifers; clear stands of resistant deciduous species are also practical undertakings. So important has this subject appeared to the United States Bureau of Entomology that they have induced the United States Forest Service, during the past year, to co-operate in experiments to test the value of forestry work in moth suppression. The Massachusetts State Forester has increased his staff by the addition of two professional foresters to the moth division of his department, and they are carrying on a regular campaign urging woodland owners in moth-infested sections to put their lands under proper forestry management. Several gangs are now at work under direction, making improvement cuttings.

If forestry work is an aid in the control of the moth, conversely the gypsy moth is of assistance in the development of forestry practice, although at first sight it would seem to be a death-blow to this development. I can safely say that as a result of our moth depredations thousands of acres of our woodlands are being put under scientific management which otherwise would never have had such care for some time to come.

In conclusion, therefore, while the expenditure of vast sums of money has been necessary to combat the moth ravages in one of the most noted insect warfares ever undertaken by a single State, nevertheless, such an expenditure has been fully warranted by the results; and to Massachusetts must be attributed the courage of attempting and prosecuting a work recognized the world over as a most plausible and worthy undertaking. The many beneficial accomplishments which have been the outgrowth of this work have contributed largely to the enrichment of both science and industry, thus making Massachusetts again a world benefactor.

The following is an abstract of an address delivered by State Forester F. W. Rane before the Convention of the Massachusetts State Firemen's Association at New Bedford, Sept. 24, 1913: —

Importance of controlling Forest Fires in Massachusetts.

Mr. President and Gentlemen of the State Firemen's Association: — I first desire to give you the assurance of my grateful appreciation of the invitation which enables me to be present at this time, privileged to participate in the deliberations of your association.

I believe that it is fast becoming an acknowledged fact that no question is of greater importance in its relation to the future prosperity of our Commonwealth than the development of forestry. The development of forestry in Massachusetts is an effort to apply a policy of foresight in handling what may be termed one of our greatest natural resources. In other words, it is a part of the great conservation movement, the importance of which is acknowledged by all thinking people.

But, gentlemen, forestry, like all other great undertakings, has to encounter obstacles and overcome them before the fullest measure of success can be attained.

In speaking to your organization at this time I shall endeavor to confine my remarks to that branch of the forestry service which, in my opinion, most directly appeals to you, namely, forest fires.

Fires injure forestry and forests in this State in several ways, which may be classified under two general divisions, — direct and indirect damage.

We all recognize the injury when commercial woodlands are burned over and the trees are killed outright, or are so injured that they will die in time. In the more thickly settled portions of our Commonwealth our woodland has a worth in excess of its value as timber or cord wood, — an æsthetic value, so to speak, — and in such cases fires cause a damage which cannot be reduced to terms of money. In any case, it is difficult to express the damage caused by fires in terms of money, but in those comparatively few cases in which it can be done, the average yearly loss is more than $200,000, and I feel safe in saying that this sum represents only a fraction of the real danger.

A direct injury, which is caused by fire and which is not considered by the ordinary layman, is the destruction of young growth. From this young growth our future forests must come, and if these immature stands are destroyed, future values are wiped out at the same time. If a plantation of young trees which has been artificially set out is destroyed, we are quick to recognize the loss, but a reproduction which has come up naturally is just as valuable, provided it gives indications of making a stand of trees as large and as salable as the artificial plantation. Young stands are not to be judged by their present condition, but by their future possibilities.

Constant fires exhaust the soil, consuming as they do the humus or dead-leaf matter which is the material from which nature manufactures our loamy soils. By the destruction of this same humus the waste-storage possibilities of the soil are taken away and drought and floods become more frequent.

These direct injuries, as great as they are, I believe are exceeded by the indirect.

Fires, or rather the fear of them, are our greatest obstacle to the practice of forestry in this State, and on the practice of forestry depends the continued existence of our lumber industry. Approach an owner of woodland and urge on him a certain forestry operation, and what will be his reply? "Oh, yes, what you say is true enough, but how am I to know that my woodlands will not burn up next year?"

Our lumber industry is more important than people realize. Our annual cut amounts to nearly 500,000,000 feet. For this lumber there is paid to the landowner $2,500,000, and there is paid out in labor to harvest this crop at least $1,000,000 more. These figures deal only with conversion of the trees into rough lumber, and have nothing to do with the further conversion of this lumber into boxes, furniture and the thousand and one articles into which our raw lumber is made. Unless we can induce our land owners to take up the proper management of our forests, this important industry is sure to be wiped out, and there is nothing which will give more encouragement to the proper management of our woodlands than the reasonable protection of them from fire. To this end we have labored hard to build up an effective forest fire protective system, and I desire to take this opportunity to express to you my appreciation of the splendid support that has been given by this association to Mr. Hutchins, the State Fire Warden, and his four district men who have been in direct charge of this work.

It may be of interest to some of you to know just what our forest-fire organization consists of. The State Fire Warden, who has supervision of the work, is assisted by four district fire wardens who are supplied with runabout automobiles. These men are charged with the supervision of the observation stations within their district, and are also continually patrolling the towns comprising their district, instructing the forest wardens and their deputies relative to their duties, assisting in extinguishing fires, visiting the selectmen and impressing upon them the importance of better equipping their towns with equipment for handling forest fires, and towns with a valuation of $1,500,000 or under, the advisability of taking advantage of the reimbursement act, whereby the State will reimburse such towns one-half for forest-fire equipment that they may purchase, the State's share not to exceed $250, and to be approved by the forestry department.

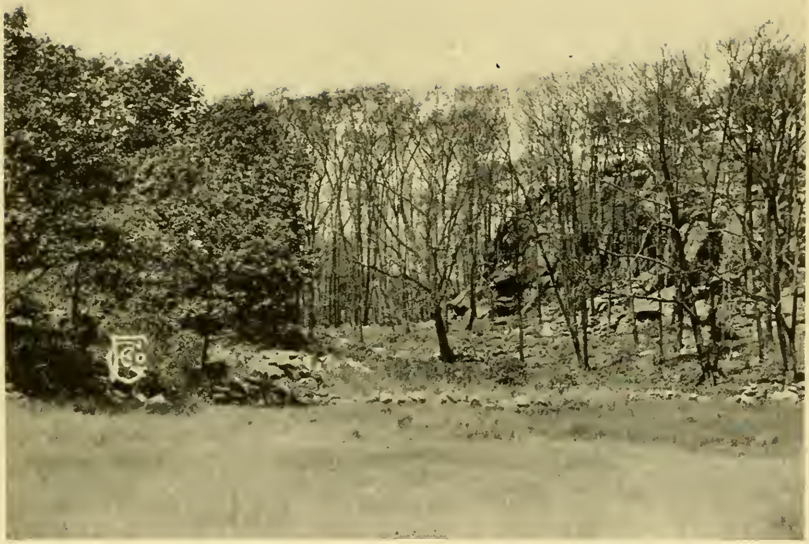
We also have an inspector who devotes his entire time to inspecting locomotives and portable saw mills. Several hundred locomotives have been inspected, and the reports show that while they were all equipped with spark arresters, as required by law, in many cases these devices were so thoroughly out of repair as to make them absolutely useless. We have also at the present time 23 observation stations established in the Commonwealth, 4 new steel towers having been built this year as follows: Manchester, Wakefield, North Hanson and Bournedale, temporary towers being built at Savoy and Pelham. These towers are all equipped with maps, field glasses and telephone which connects with over 1,800 forest wardens and deputies, the observers in charge being local men in nearly every instance, who are thoroughly familiar with the surrounding territory.

While we have had nearly 3,000 fires reported from these stations to the different wardens, we have had very few serious fires, notably, the Freetown, Bourne, Yarmouth and Shutesbury fires which were allowed to burn for days. These fires were practically extinguished the first day, but were left at night without sufficient help to control, only to start up the second day, unnecessary back fires being set that were soon beyond control.

One matter which I deem of vital importance, and to which I desire to call your attention, is the necessity of a law which will provide for a reasonable disposition of the slash or brush which is now left on the ground following wood and lumber operations. I might state here that the two or three serious fires which I have referred to would have been impossible had it not been for the fact that where they occurred hundreds of acres of this slash had been left, so extinguishment was made almost an impossibility. For several years I have recommended in my annual report to the Legislature the imperative need of a law which would obviate this condition, but no action has yet been taken. The incoming Legislature will again be asked to consider the same subject, and I desire to say here that your organization can render no more valuable service to the State Forestry Department than by sending representatives before the proper committees of the Legislature to urge the passage of the bill.

The Fifth National Conservation Congress.

The conservation of our natural resources and their proper use constitutes a problem of gigantic proportions upon the wise solving of which depends very largely the abiding prosperity of the nation. Of such vital importance was it considered by Theodore Roosevelt, that in May, 1908, he called together in convention the Governors of all the States of the Union to consider the question of how best to bring about a reform of the present wasteful methods of production and utilization of our natural resources, such as minerals, timber, water power, soils, in fact, all the natural wealth with which we as a nation are so richly endowed, to the end that their benefits may be shared equally among all the people, and that there may be transmitted a practically undiminished capital to the generations to come. As a result of that conference there was organized the National Conservation Congress, and the conservation senti-



A view of sprayed and unsprayed trees on the North Shore. The modern high power solid stream sprayer has revolutionized the work of spraying woodlands. One thorough spraying has held the foliage against very adverse conditions, as shown at the left.

ment was crystalized into a nation-wide movement. Chief among the objects for which the National Conservation Congress was created, as annunciated in its declaration of principles, is to "afford an agency through which the people of the country may frame policies and principles affecting the conservation and utilization of their resources, to be put into effect by their representatives in State and federal governments." This year's congress convened at Washington, D. C., on November 17, and its sessions lasted through four days. The official delegates appointed by the Governor to represent Massachusetts at this congress were State Forester F. W. Rane and Sec. C. O. Bailey. Its discussions were devoted largely to forest conservation because of the national importance of the subject in its many phases. Practically all the leading foresters of the United States were in attendance, and the discussions on the various branches of forestry were of great value to those who were privileged to hear them.

New Legislation.

The following bills relating to forestry were enacted at the last session of the General Court and were intended to advance the forestry interests of the Commonwealth: —

Forest Taxation.

Reference was made in the last annual report of the adoption by the voters of the State of an amendment to the Constitution relative to the taxation of wild or forest lands. This action was taken at the election in 1912, following which the Legislature of 1913 passed the following resolve: —

Acts of 1913, Chapter 131.

Resolve to provide for the Appointment of a Commission to investigate and report upon the Taxation of Wild or Forest Lands.

Resolved, That the governor, with the advice and consent of the council, shall, within thirty days after the passage of this resolve, appoint a commission of five persons, citizens of the commonwealth, to be known as the commission on the taxation of wild or forest lands. Said commission shall investigate the effect of the present laws relating to the taxation of wild or forest lands in this commonwealth, and the laws and systems of taxation of such lands in operation in other states and countries, shall correspond so far as may be advisable with authorities in this commonwealth and in other states and countries in regard to said matters, and shall draft an act providing such methods of taxation of wild or forest lands as will develop and conserve the forest resources of the commonwealth. The said commission shall also investigate the present policy of the commonwealth with regard to the acquisition and management of wild or forest lands and report what further legislation, if any, is necessary. The report shall also contain a compilation of statistics and other information obtained by the commission and shall be made on or before the first Wednesday in January, nineteen hundred and fourteen. Of the said commissioners, one member shall be the tax commissioner and one member shall be the state forester. The members of the commission shall serve without compensation, but may incur such expenses in the performance of their duties, not exceeding the amount of five thousand dollars, as may be authorized by the governor and council. The commission shall be provided with suitable quarters in the state house or elsewhere. [*Approved June 16, 1913.*

Acting under the authority given him by this resolve, the Governor appointed, as members of this commission, the State Tax Commissioner, W. D. T. Trefry, the State Forester, F. W. Rane, as required by the resolve, Mr. Harold Parker, ex-chairman of the Massachusetts Highway Commission, Prof. C. J. Bullock, professor of economics at Harvard University and Mr. Charles H. Preston of Danvers. The commission promptly organized with Tax Commissioner Trefry as chairman, and immediately entered upon its duties. Public hearings were advertised and held in the following places: October 31, at the State House; November 5, at Greenfield; November 6, at Springfield; November 7, at Pittsfield; November 14, at Worcester; November 21, at the State House; November 28, at Middleborough.

Nearly all of these hearings were largely attended, and the commission acquired very much valuable information and data bearing upon the problem given it to solve.

Moth Superintendent and Forest Warden Appointments changed.

The importance of beginning moth suppression operations as early as possible in each year with a thoroughly organized force of men in every city and town where such work is necessary, also to allow for sufficient time to instruct forest wardens with regard to the prevention and extinguishment of forest fires before the dry and dangerous periods occur, were the reasons for changing the time of making the appointment of local moth superintendent and forest warden from March or April to January.

ACTS OF 1913, CHAPTER 6.

AN ACT RELATIVE TO THE TIME OF APPOINTMENT OF LOCAL SUPERINTENDENTS FOR THE SUPPRESSION OF GYPSY AND BROWN TAIL MOTHS AND RELATIVE TO THE APPOINTMENT OF FOREST WARDENS.

Be it enacted, etc., as follows:

SECTION 1. Section sixteen of chapter thirty-two of the Revised Laws, as amended by section one of chapter four hundred and seventy-five of the acts of the year nineteen hundred and seven, is hereby further amended by striking out the words "March or April", in the third line, and inserting in place thereof the word: — January, — so as to read as follows: — *Section 16.* The mayor and aldermen in cities and the selectmen in towns shall annually, in January, appoint a forest warden, and they shall forthwith give notice of such appointment to the state forester. The appointment of a forest warden shall not take effect unless approved by the state forester, and when so approved notice of the appointment shall be given by the mayor and aldermen or by the selectmen to the person so appointed and approved. Whoever having been duly appointed fails within seven days after the receipt of such notice to file with the city or town clerk his acceptance or refusal of the office shall, unless excused by the mayor and aldermen or by the selectmen, forfeit ten dollars. Nothing in this act or in any other act shall be construed to prevent the offices of tree warden, selectman, chief of fire department and forest warden from being held by the same person.

SECTION 2. Section four of chapter three hundred and eighty-one of the acts of the year nineteen hundred and five, as amended by section two of chapter two hundred and sixty-eight of the acts of the year nineteen hundred and six, and by section one of chapter five hundred and twenty-one of the acts of the year nineteen hundred and seven, and by chapter one hundred and fifty of the acts of the year nineteen hundred and ten, is hereby further amended by striking out the words "March or April", in the third line, and inserting in place thereof the word: — January, — so as to read as follows: — *Section 4.* The mayor and aldermen in cities and the selectmen in towns shall annually in the month of January appoint a local superintendent for the suppression of gypsy and brown tail moths. Said superintendents shall, under the advice and general direction of the state forester, destroy the eggs, caterpillars, pupæ and nests of the gypsy and brown tail moths within their limits, except in parks and other property under the control of the commonwealth, and except in private property, save as otherwise provided herein. The appointment of a local superintendent shall not take effect unless approved by the state forester, and when so approved, notice of the appointment shall be given by the mayor and aldermen or the selectmen to the person so appointed. When any city or town shall have expended within its limits city or town funds to an amount in excess of five thousand dollars in any one fiscal year, in suppressing gypsy or brown tail moths, the commonwealth shall reimburse such city or town to the extent of fifty per cent of such excess above said five thousand dollars.

SECTION 3. This act shall take effect on the first day of January, nineteen hundred and fourteen. [*Approved May 2, 1913.*

Furnishing Arsenate of Lead at Cost.

As a further aid to property owners in the suppression of gypsy and brown-tail moths, a bill was passed by the General Court, giving authority to local superintendents in such towns as are receiving aid from the State to furnish arsenate of lead to property owners at a price not to exceed the cost to the State. The act reads as follows: —

AN ACT TO AUTHORIZE LOCAL MOTH SUPERINTENDENTS TO FURNISH ARSENATE OF LEAD TO REAL ESTATE OWNERS.

Be it enacted, etc., as follows:

SECTION 1. For the purpose of assisting in the extermination of gypsy and brown tail moths, the local moth superintendent in any city or town now receiving aid from the commonwealth, in suppressing the said insect pests is hereby authorized to furnish, at the cost thereof, arsenate of lead to any owner of real estate situated within the limits of such city or town. Material purchased under the provisions hereof shall be used only for the suppression of gypsy and brown tail moths and only upon land of the purchaser.

SECTION 2. The amounts due for material furnished under the provisions of section one shall be charged by the local moth superintendent to the owners of private estates and shall be collected in the same manner as the amounts assessed for private work, and shall be a lien on said estates in the same manner as the assessments for private work. The amount thus charged shall be deducted from the total amount expended in each city or town in the suppression of the gypsy and brown tail moths in the same manner as the amounts charged for private work, as provided for in sections six and seven of chapter three hundred and eighty-one of the acts of the year nineteen hundred and five and its several amendments. [*Approved May 7, 1913.*

Public Domain.

Taking cognizance of the great possibilities which lie in forestry as a means of adding to the wealth and prosperity of the State, the Massachusetts Forestry Association has devoted much of its energy during the past year to organizing branch associations in various cities and towns of the Commonwealth, with the hope that an aroused local interest would result in the establishment of municipal forests in conformity to the public domain act as amended last year through the efforts of that association.

The act as amended follows: —

ACTS OF 1913, CHAPTER 564.

AN ACT RELATIVE TO PUBLIC DOMAIN.

Be it enacted, etc., as follows:

SECTION 1. Section twenty-three of chapter twenty-eight of the Revised Laws is hereby amended by striking out the word "a", before the word "town", in the second line, and inserting in place thereof the words: — an annual, — by inserting after the word "therefor", in the eighth line, the words: — but the indebtedness so incurred shall be limited to an amount not exceeding one half of one per cent of the last preceding assessed valuation of the city or town, — and by striking out the words "commonwealth for the benefit of the", in the eleventh line, so as to read as follows: — *Section 23.* A town, by a vote of two thirds of the legal voters present and voting at an annual town meeting, or a city in which the city council consists of two branches, by a vote of two thirds of the members of each branch, and a city in which there is a single legislative board, by a vote of two thirds of the members thereof, present and voting thereon, may take or purchase land within their limits, which shall be a public domain, and may appropriate money and accept gifts of money and land therefor; but the indebtedness so incurred shall be limited to an amount not exceeding one half of one per cent of the last preceding assessed valuation of the city or town. Such public domain shall be devoted to the culture of forest trees, or to the preservation of the water supply of such city or town and the title thereto shall vest in the city or town in which it lies.

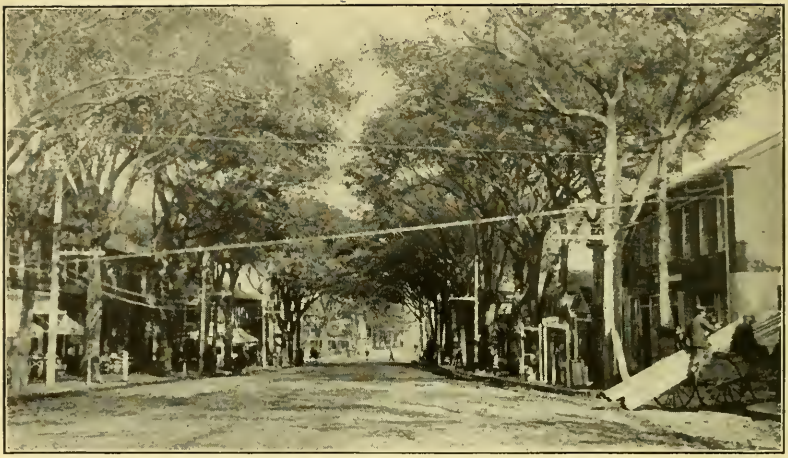
SECTION 2. Said chapter twenty-eight is hereby further amended by striking out section twenty-five and inserting in place thereof the following: — *Section 25.* The city or town forester in each city or town, with one or more keepers appointed by him, shall have the management and charge of all such public domain in that city or town, and within such public domain shall have the powers of constables and police officers in towns. But a town by a vote of two thirds of the legal voters present and voting at an annual town meeting, or a city in which the city council consists of two branches, by a vote of two thirds of the members of each branch, and a city in which there is a single legislative board, by a vote of two thirds of the members thereof present and voting thereon, may place all such public domain within its limits under the general supervision and control of the state forester, who shall thereupon, upon notification thereof, make regulations for the care and use of such public domain and for the planting and cultivating of trees therein, and the city or town forester in such case and his keepers, under the supervision and direction of the state forester, shall be charged with the duty of enforcing all such regulations and of performing such labor therein as may be necessary for the care and maintenance thereof; and within such public domain shall have the powers of constables and police officers in towns.

Section 3. Said chapter twenty-eight is hereby further amended by striking out section twenty-six and inserting in place thereof the following: — *Section 26.* Any such city or town may lease any building on a public domain, and shall apply all sums derived from rents or from the sale of the products of any such domain, so far as may be necessary, to the management thereof.

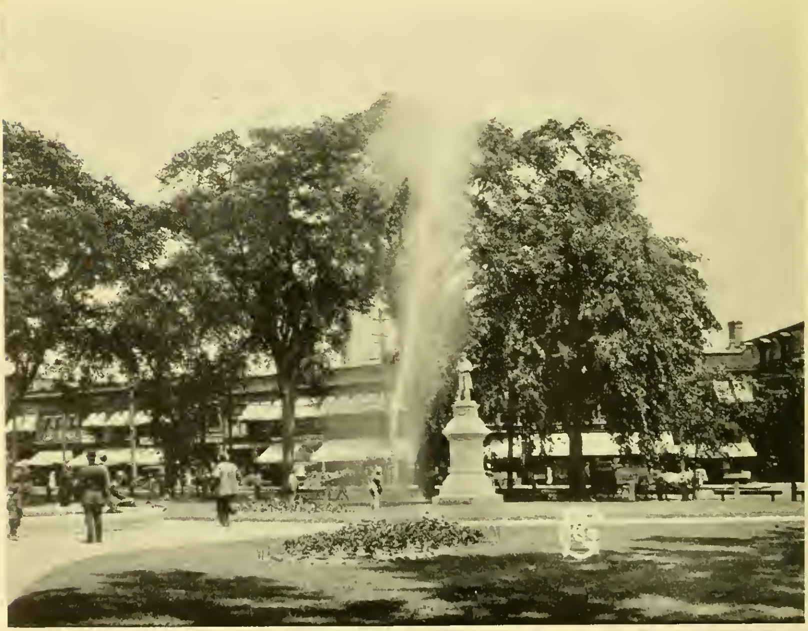
Section 4. Said chapter twenty-eight is hereby further amended by striking out section twenty-seven and inserting in place thereof the following: — *Section 27.* Any city or town in which such public domain is situated may erect thereon any building for public instruction or recreation: *provided,* that if such public domain has been placed under the supervision and control of the state forester, under the provisions of this act, no such building shall be erected unless his approval shall first be obtained.

Section 5. Said chapter twenty-eight is hereby further amended by striking out section twenty-nine and inserting in place thereof the following: — *Section 29.* For the purpose of defraying the expenses incurred under the provisions of the six preceding sections any city or town may issue from time to time, and to an amount not exceeding the sum actually expended for the taking or purchase of lands for such public domain, bonds or notes. Such bonds or notes shall be denominated on the face thereof, City or Town of , Public Domain Loan, Act of 1913; shall be payable by such annual payments, beginning not more than one year after the date thereof, as will extinguish each loan within thirty years from its date; and the amount of such annual payment of any loan in any year shall not be less than the amount of the principal of said loan payable in any subsequent year. Each authorized issue of bonds or notes shall constitute a separate loan. The bonds or notes shall bear interest at a rate not exceeding four and one half per cent per annum, payable semi-annually; and shall be signed by the treasurer and countersigned by the mayor of the city or, in the case of a town, shall be signed by the treasurer and countersigned by the selectmen. The city, by its mayor and treasurer, and the town, by its selectmen and treasurer, may sell such bonds or notes at public or private sale, upon such terms and conditions as they may deem proper, but the bonds or notes shall not be sold for less than their par value; and the proceeds shall be used only for the purposes herein specified.

Section 6. The city or town shall at the time of authorizing said loan or loans provide for the payment thereof in accordance with the foregoing provisions of this act; and when a vote to that effect has been passed by the city council, or at any annual town meeting, a sum which will be sufficient to pay the interest as it accrues on the bonds or notes issued as aforesaid by the city or town, and to make such payments on the principal as



The main street at Nantucket. We think of the island of Nantucket as lacking in tree growth. It is largely a question of soil and wind protection. It is believed that with wind breaks of the hardier growing species, and by taking advantage of natural shelters, much of the island could be gradually reforested.



Spraying tall trees in the Taunton public square with the solid stream high-power sprayer, which was brought out originally by this department. Most of the principal towns and cities where the gypsy and brown-tail moths prevail have these power sprayers.

may be required under the provisions of this act, shall, without further vote, be assessed by the assessors of the city or town annually thereafter, in the same manner in which other taxes are assessed, until the debt incurred by said loan or loans is extinguished.

SECTION 7. This act shall take effect upon its passage. [*Approved April 26, 1913.*

FINANCIAL STATEMENTS.

General Forestry.

In accordance with section 6, chapter 409 of the Acts of 1904, as amended by section 1, chapter 473, Acts of 1907, the following statement is given of the forestry expenditure for the year ending Nov. 30, 1913: —

State Forester's Expenses.

Appropriation for 1913,		$20,000 00
Expenditures: —		
Salaries of assistants,	$7,631 69	
Traveling expenses,	3,246 84	
Stationery and postage, etc.,	708 13	
Printing,	723 72	
Maps,	198 15	
Equipment,	246 87	
Sundries,	285 30	
Nursery account: —		
Pay roll,	5,231 10	
Travel,	59 61	
Equipment,	700 68	
Teaming, express and freight,	715 39	
Telephone, water, gasoline, dynamite, etc.,	252 25	
		19,999 73
Balance returned to treasury,		$0 27

Purchase and Planting of Forest Lands.

Appropriation for 1913,		$10,000 00
Expenditures: —		
Pay roll,	$6,604 35	
Travel,	480 04	
Tools and equipment,	324 54	
Express and teaming,	288 78	
Land,	2,138 75	
Stationery and postage,	141 03	
Sundries,	22 35	
		9,999 84
Balance returned to treasury,		$0 16

Prevention of Forest Fires.

Appropriation for 1913,	$20,000 00	
Receipts: —		
Spofford estate,	200 00	
Protest on Spofford check,	1 35	
Wm. D. Sohier,	400 00	
Town of Wakefield,	350 00	
Town of Halifax,	50 00	
Town of Plympton,	75 00	
Town of Hanson,	100 00	
Town of Duxbury,	100 00	
Town of Whitman,	75 00	
Town of Hanover,	100 00	
Town of Marshfield,	50 00	
Town of Bourne,	300 00	
Town of Wareham,	150 00	
Town of Sterling,	18 75	
Town of Dunstable,	11 81	
Town of Ashland,	11 50	
Wm. D. Sohier, agent,	500 00	
Town of Upton,	12 50	
New England Telephone and Telegraph Company,	23	
		$22,506 14
Expenditures: —		
Salaries,	$11,301 60	
Travel,	4,262 42	
Printing,	538 32	
Stationery and postage,	256 38	
Equipment,	2,568 69	
Construction,	1,877 62	
Telephone,	1,275 90	
Express,	59 51	
Sundries,	365 52	
		22,505 96
Balance returned to treasury,		$0 18
Reimbursement for fire-fighting apparatus to towns,		$5,012 48

Suppression of Gypsy and Brown-tail Moths.

The balance shown on the general appropriation for the suppression of the gypsy and brown-tail moths, as carried at the end of the fiscal year, will be all practically expended in reimbursements to towns and cities for the work of the year ending Nov. 30, 1913.

General Appropriation.

Balance on hand Nov. 30, 1912,	$103,174 00	
Less reimbursement due for 1912,	61,016 06	
Balance for 1913 work,	$42,157 94	
Receipts: —		
Appropriation for 1913 (made in 1912),	75,000 00	
Town of Easton,	270 33	
Town of West Bridgewater,	234 44	
City of Lowell,	22 14	
Town of Andover,	194 23	
Town of Hingham,	157 48	
City of Medford,	411 85	
Town of Lexington,	154 53	
Town of Arlington,	1,117 83	
Town of Stoneham,	106 21	
Town of Westwood,	600 00	
Town of Milton,	800 00	
Appropriation for 1913,	125,000 00	
Town of Milton,	854 75	
Town of Westwood,	345 58	
Town of Walpole,	600 00	
Town of Wakefield,	959 48	
For old truck sold,	85 00	
Appropriation for 1914,	75,000 00	
For motor cycles sold,	425 00	
Town of Winchester,	985 38	
Adams Express Company,	15	
City of Quincy,	1,225 11	
Special North Shore Fund,	7,644 06	
Purchase and planting of forest lands,	6 58	
State Forester's expenses,	34 15	
Prevention of forest fires,	4 15	
Dover gypsy moth fund,	204 95	
Howe & French (paid in error),	20 25	
Town of Holliston,	15 00	
Town of Millis,	12 00	
Town of Natick,	48 15	
Town of Hopkinton,	683 86	
		$335,380 58
Amount carried forward,		$335,380 58

Amount brought forward,		$335,380 58
Office expenses: —		
Salaries of clerks,	$2,741 59	
Rent of offices,	2,139 98	
Stationery and postage,	919 72	
Printing,	840 09	
Expert's services,	125 00	
Office and laboratory supplies,	278 18	
Forester's supplies,	66 67	
Educational work,	40 91	
Sundries,	864 81	
Field expenses: —		
Wages of employees,	28,688 83	
Traveling expenses,	8,300 83	
Tools and supplies,	120,463 68	
Special work,	14,700 00	
Rent of supply store,	749 60	
Supply store equipment,	87 45	
Sundries, including teaming,	754 33	
Reimbursement towns and cities,	32,060 21	
		213,822 48
Balance on hand Nov. 30, 1913,		$121,558 10
Reimbursement paid December, 1913, and January, 1914, for the year 1913,		48,471 60

Special North Shore Fund.

Receipts: —		
Balance from 1912,	$3,682 05	
South End Improvement Association of Rockport,	500 00	
F. W. Rane, State Forester,	500 00	
Town of Rockport,	500 00	
Whitcomb Carter Company refund,	60	
F. W. Rane, State Forester,	1,200 00	
W. D. Sohier, agent,	1,200 00	
Town of Manchester,	5,000 00	
F. W. Rane, State Forester,	10,000 00	
W. D. Sohier, agent,	10,000 00	
City of Beverly,	5,000 00	
J. D. Barnes, for sprayer sold,	300 00	
State Forester's expenses,	153 06	
Pump and engine sold,	85 00	
Transfer from appropriation for suppression of gypsy and brown-tail moths,	1,306 30	
Wm. D. Sohier, for property owners,	2,427 66	
		$41,854 67
Amount carried forward,		$41,854 67

Amount brought forward,		$41,854 67
Expenditures: —		
Wages of employees,	$18,944 98	
Traveling expenses,	1,016 96	
Rent,	310 00	
Supplies,	9,670 63	
Sundries, including teaming, etc.,	1,873 09	
Storehouse equipment,	37 65	
Stationery and postage,	1 35	
Office supplies,	25	
		31,859 91
Balance on hand Nov. 30, 1913,		$9,999 76

The following is a list of towns and cities, with amount of supplies for moth work furnished for the year ending Nov. 30, 1913: —

Acton,[1]	$2,148 73
Andover,	911 31
Arlington,[1]	2,330 99
Ashburnham,	209 75
Ashby,	174 17
Ashland,[1]	1,564 72
Avon,	47 80
Ayer,[1]	1,804 80
Bedford,[1]	3,057 36
Berkley,	43 80
Berlin,	237 52
Billerica,	603 61
Bolton,	337 96
Boxborough,	584 29
Boxford,	429 81
Boylston,	118 28
Braintree,[1]	2,355 76
Bridgewater,[1]	1,684 75
Burlington,[1]	2,020 54
Canton,	772 83
Carlisle,	460 29
Carver,	246 92
Chelmsford,	638 82
Cohasset,	2,447 58
Concord,	672 17
Danvers,	614 28
Dedham,[1]	3,410 81
Dover,	3 20
Dracut,	320 54
Dunstable,	140 24
Duxbury,	269 08
Easton,	$12 50
Essex,	85 56
Fitchburg,	1 87
Georgetown,	454 95
Gloucester,	213 83
Greenfield,	2 01
Groton,	535 07
Groveland,	193 26
Halifax,	12 91
Hamilton,	843 01
Hanover,	374 92
Hanson,	57 32
Harvard,	532 23
Haverhill,	24
Hingham,[1]	2,711 66
Holden,	8 40
Hopkinton,	89 23
Hudson,	301 86
Ipswich,	779 22
Kingston,	361 94
Lexington,[1]	2,461 24
Lincoln,[1]	3,727 66
Littleton,[1]	1,964 62
Lunenburg,[1]	1,855 53
Lynnfield,	626 92
Marlborough,	854 12
Marshfield,	798 24
Mashpee,	286 74
Maynard,[1]	1,542 04
Medfield,	2 00
Medford,	1,040 94

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[1] Received sprayers from the State, agreeing to pay one-half the cost.

Merrimac,	$215 10
Methuen,	907 65
Middleborough,	681 09
Middleton,	301 09
Milton,[1]	4,302 76
Natick,	87 80
Newbury,	581 79
Newton,	9,849 28
Norfolk,	111 58
North Andover,	538 20
North Reading,	1,344 45
Northborough,[1]	1,492 33
Norwell,	1,021 27
Pembroke,	63 60
Pepperell,	422 93
Plympton,	134 08
Princeton,	1 80
Quincy,	1,146 64
Raynham,	61 23
Reading,	1,464 88
Rochester,	29 35
Rowley,	246 50
Royalston,	3 90
Salisbury,	304 22
Sandwich,	139 99
Saugus,	763 79
Scituate,[1]	4,511 70
Sherborn,	333 55
Shirley,	313 83
Shrewsbury,	$38 81
Southborough,[1]	1,459 70
Sterling,	336 75
Stoneham,	688 48
Stow,	403 49
Sudbury,	455 90
Templeton,	1 69
Tewksbury,	598 20
Topsfield,	194 85
Townsend,	286 69
Tyngsborough,[1]	2,228 41
Waltham,	1,779 26
Wayland,	766 15
Wakefield,	829 68
Wellesley,	3 50
Wenham,[1]	1,589 19
West Bridgewater,	277 02
West Newbury,	318 45
Westborough,[1]	1,850 17
Westford,	1,046 41
Westminster,	102 56
Weston,[1]	3,700 90
Weymouth,[1]	2,360 53
Wilmington,[1]	2,586 52
Winchendon,	179 17
Wilbraham,	39
Woburn,	1,418 76
	$110,273 76

Dover gypsy moth fund,	111 20
Forestry department,	48 63
Forest fire prevention,	16 99
Thinning work equipment,	78 19
Special North Shore Fund,	7,644 06
Pine Banks,	173 25
Reforestation,	6 58
Traveling pump,	14 63
Traveling sprayer, (1),	18 50
Traveling sprayer, (2),	393 14
Traveling sprayer, (3),	572 41
Traveling sprayer, (4),	196 51
Traveling sprayer, (5),	182 09
Traveling sprayer, (6),	75 00
Traveling sprayer, (7),	476 48
Traveling sprayer, (8),	612 27
Traveling sprayer, (9),	72 50
Truck,	4 37
United States Department of Agriculture,	3 72
Repairs on automobiles,	402 67
	$121,376 95

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[1] Received sprayers from the State, agreeing to pay one-half the cost.

FINANCIAL SUMMARY OF MOTH WORK BY TOWNS.

The following table shows the reimbursement paid to cities and towns for the year 1912, the total net expenditure, the required expenditure before receiving reimbursement from the State, the amount received for work on private property returned to this office, and the amount of reimbursement paid for 1913, and also the required expenditure for 1914. Towns marked with an asterisk received supplies from this office.

CITIES AND TOWNS.	1912. Re-imbursement.	1913. Required Expenditure.	1913. Total Net Expenditure.	1913. Private Work.	1913. Re-imbursement.	1914. Required Expenditure.
Abington,	-	$1,361 05	-	-	-	$1,403 51
Acton,	$997 85*	970 13	$2,120 13	$320 44	$550 00*	975 90
Acushnet,	-	402 86	-	-	-	439 31
Amesbury,	-	2,615 03	1,809 64	1,045 60	-	2,626 67
Andover,	-*	2,883 11	2,855 09	1,523 99	-*	3,234 59
Arlington,	-*	5,000 00	4,985 65	1,546 98	-*	5,000 00
Ashburnham,	104 75*	488 17	919 20	445 19	431 03*	500 72
Ashby,	233 48*	239 32	506 52	69 50	271 97*	248 18
Ashland,	243 78*	585 00	570 61	270 96	-*	600 12
Athol,	-	2,216 99	-	-	-	2,342 62
Attleborough,	-	5,000 00	-	-	-	5,000 00
Auburn,	-	554 00	-	-	-	634 80
Avon,	122 02*	414 70	589 90	62 30	175 20*	431 88
Ayer,	-	922 45	1,410 09	67 35	-*	927 85
Barnstable,	-	3,175 20	-	-	-	3,370 26
Barre,	-	1,091 02	-	-	-	1,053 58
Bedford,	2,296 80*	667 80	2,661 43	1,781 28	1,393 63*	716 31
Bellingham,	-	383 65	-	-	-	382 26
Belmont,	-	3,015 78	2,070 04	-	-	3,297 49
Berkley,	97 22*	165 77	234 05	57 40	68 28*	208 21
Berlin,	1,009 27*	243 10	1,018 89	367 27	775 79*	249 31
Beverly,	-	5,000 00	4,661 05	-	-	5,000 00
Billerica,	854 89*	1,132 00	1,207 41	728 81	75 41*	1,385 80
Blackstone,	-	948 29	-	-	-	968 97
Bolton,	872 76*	258 98	1,033 93	227 27	774 95*	271 59
Boston,	20,000 00	5,000 00	49,332 73	15,025 52	9,849 89	5,000 00

CITIES AND TOWNS.	1912. Re-imbursement.	1913. Required Expenditure.	1913. Total Net Expenditure.	1913. Private Work.	1913. Re-imbursement.	1914. Required Expenditure.
Bourne,	-	$2,881 49	-	-	-	$3,057 72
Boxborough,	$1,321 99*	116 41	$1,464 91	$239 28	$1,348 50*	117 39
Boxford,	2,052 20*	610 32	2,015 65	400 92	1,405 33*	614 49
Boylston,	-*	207 40	734 53	310 67	527 13*	212 02
Braintree,	-	3,163 39	3,927 33	995 56	-*	3,495 80
Brewster,	-	354 44	-	-	-	325 23
Bridgewater,	-	1,447 26	2,139 56	211 69	92 30*	1,543 15
Brockton,	-	5,000 00	-	-	-	5,000 00
Brookfield,	-	541 40	-	-	-	545 63
Brookline,	-	5,000 00	-	-	-	5,000 00
Burlington,	1,496 58*	310 18	1,947 98	205 05	1,037 80*	316 41
Cambridge,	-	5,000 00	-	-	-	5,000 00
Canton,	686 36*	2,133 36	3,600 86	1,591 25	800 00*	2,543 23
Carlisle,	2,792 25*	191 37	2,741 29	364 03	2,549 92*	199 17
Carver,	489 82*	770 99	1,394 70	591 11	623 71*	790 28
Charlton,	-	522 40	-	-	-	518 93
Chelmsford,	500 71*	1,753 60	1,828 15	1,009 28	74 55*	1,785 87
Chelsea,	-	5,000 00	-	-	-	5,000 00
Clinton,	-	3,632 43	2,469 94	-	-	3,661 51
Cohasset,	1,011 89*	3,802 02	4,578 72	2,600 54	131 85*	4,417 09
Concord,	1,105 28*	3,372 27	3,998 89	1,825 72	366 87*	3,520 46
Danvers,	1,297 13*	2,792 62	3,952 56	1,614 47	805 10*	3,016 55
Dartmouth,	-	1,841 43	-	-	-	2,007 73
Dedham,	-	5,000 00	6,090 84	2,578 71	-*	5,000 00
Dennis,	-	530 67	-	-	-	545 11
Dighton,	-	527 86	-	-	-	548 88
Douglas,	-	551 50	-	-	-	526 50
Dover,	-	2,515 57	2,638 12	916 67	97 40*	3,079 54
Dracut,	297 32*	1,013 87	1,585 99	1,159 04	576 66*	1,008 01
Dudley,	-	794 74	-	-	-	825 65
Dunstable,	796 71*	170 36	904 14	335 33	733 78*	171 65
Duxbury,	257 70*	1,268 83	1,578 55	824 24	309 72*	1,764 16
East Bridgewater,	56 54*	903 05	578 87	257 55	-	945 66
Easton,	-*	2,408 14	-	-	-*	2,792 83
Essex,	603 31	496 97	1,095 75	402 50	598 78*	501 86
Everett,	-	5,000 00	1,014 19	-	-	5,000 00
Fall River,	-	5,000 00	-	-	-	5,000 00

CITIES AND TOWNS.	1912. Re-imburse-ment.	1913. Required Expendi-ture.	1913. Total Net Expendi-ture.	1913. Private Work.	1913. Re-imburse-ment.	1914. Required Expendi-ture.
Fairhaven,	-	$1,554 84	-	-	-	$1,631 10
Falmouth,	-	4,718 70	-	-	-	4,341 80
Fitchburg,	-*	5,000 00	-	-	-*	5,000 00
Foxborough,	-	1,033 04	-	-	-	1,059 05
Framingham,	-	5,000 00	$4,067 73	-	-	5,000 00
Franklin,	-	1,773 40	-	-	-	1,880 97
Freetown,	-	397 86	-	-	-	407 73
Gardner,	-	4,005 63	-	-	-	4,195 02
Georgetown,	$1,458 48*	498 01	1,595 64	$734 60	$1,097 63*	509 37
Gloucester,	1,623 07*	5,000 00	6,872 77	1,971 97	829 48*	5,000 00
Grafton,	-	1,168 22	727 22	250 00	-	1,219 66
Great Barrington,	-	2,536 84	-	-	-	2,749 12
Greenfield,	-	4,324 33	-	-	-*	4,597 02
Groton,	76 95*	1,645 19	1,692 70	379 45	47 51*	1,735 29
Groveland,	920 33*	486 64	1,155 93	292 72	669 29*	492 33
Halifax,	438 40*	260 10	781 79	471 81	521 69*	262 17
Hamilton,	1,035 53*	1,874 57	2,668 86	881 90	400 00*	2,080 78
Hanover,	857 97*	638 09	1,370 22	1,169 59	732 13*	784 20
Hanson,	916 36*	551 32	1,111 05	189 68	559 73*	580 61
Harvard,	533 78*	680 53	1,560 37	938 29	879 84*	702 06
Harwich,	-	595 06	-	-	-	627 67
Haverhill,	-	5,000 00	4,009 55	1,998 35	-*	5,000 00
Hingham,	-*	3,116 37	3,752 18	3,260 55	-*	3,281 43
Holbrook,	-	639 20	-	-	-	661 97
Holden,	-	712 78	929 92	428 16	217 14*	725 84
Holliston,	-	787 43	-	-	-	807 10
Hopedale,	-	2,365 45	-	-	-	2,388 25
Hopkinton,	-*	702 60	1,289 72	440 00	587 12*	727 08
Hubbardston,	-*	307 48	457 81	156 13	150 33	315 47
Hudson,	249 65*	1,618 63	1,818 20	648 83	199 57*	1,659 29
Hull,	-	3,039 23	-	-	-	3,258 48
Ipswich,	24 40*	2,295 12	2,703 75	1,325 40	408 63*	2,196 02
Kingston,	224 05*	660 18	2,001 61	446 73	1,341 43*	671 96
Lakeville,	-	426 08	-	-	-	464 75
Lancaster,	-*	2,140 57	-	-	-	2,744 58
Lawrence,	-	5,000 00	1,912 30	-	-	5,000 00
Leicester,	-	972 41	-	-	-	1,002 99

Cities and Towns.	1912. Re-imbursement.	1913.				1914. Required Expenditure.
		Required Expenditure.	Total Net Expenditure.	Private Work.	Re-imbursement.	
Lenox,	-*	$3,133 87	-	-	-	$3,585 22
Leominster,	-	5,000 00	-	-	-	5,000 00
Lexington,	$2,548 47*	3,242 41	$6,624 66	$1,669 33	$1,723 83*	3,425 04
Lincoln,	448 27*	1,615 75	2,136 55	2,064 92	-*	1,751 04
Littleton,	876 73*	467 68	1,380 54	99 50	312 86*	477 62
Lowell,	-*	5,000 00	3,165 04	3,752 97	-	5,000 00
Lunenburg,	866 44*	534 53	1,623 79	936 84	489 26*	557 11
Lynn,	-*	5,000 00	2,532 69	-	-	5,000 00
Lynnfield,	1,189 29*	479 72	2,461 49	514 53	1,981 77*	507 20
Malden,	-	5,000 00	-	-	-	5,000 00
Manchester,	-	5,000 00	-	-	-	5,000 00
Mansfield,	-	1,672 18	-	-	-	1,768 66
Marblehead,	-	4,079 57	1,633 00	1,547 63	-	3,764 06
Marion,	-	2,065 46	-	-	-	2,066 85
Marlborough,	-*	4,278 62	4,834 20	2,787 64	141 49*	4,289 75
Marshfield,	442 17*	1,064 55	1,723 55	1,188 26	659 00*	1,129 52
Mashpee,	750 73*	97 38	1,426 96	110 80	1,328 06*	100 03
Mattapoisett,	-	798 62	-	-	-	740 39
Maynard,	-	1,632 04	2,152 75	313 72	-*	1,637 82
Medfield,	-	676 33	-	-	-*	726 81
Medford,	-*	5,000 00	3,910 42	2,202 71	-*	5,000 00
Medway,	-	686 51	-	-	-	688 73
Melrose,	-	5,000 00	-	-	-	5,000 00
Mendon,	-	275 44	-	-	-	277 51
Merrimac,	1,037 27*	535 89	1,312 69	333 96	776 80*	513 78
Methuen,	373 57*	3,194 64	3,621 26	2,552 70	159 77*	3,360 68
Middleborough,	693 12*	1,939 92	2,709 92	945 03	770 00*	1,993 88
Middleton,	1,289 32*	354 60	1,403 53	324 40	1,048 93*	364 61
Milford,	-	3,954 62	-	-	-	4,029 46
Millbury,	-	1,193 41	-	-	-	1,186 66
Millis,	-	539 09	147 93	-	-	547 23
Milton,	-	5,000 00	4,520 46	9,875 27	-*	5,000 00
Nahant,	-	3,673 72	-	-	-	3,627 12
Natick,	-*	3,479 07	3,070 81	1,658 54	-*	3,536 28
Needham,	-	2,926 47	-[1]	-	-	3,110 46
New Bedford,	-	5,000 00	-	-	-	5,000 00
New Braintree,	-	161 38	-	-	-	169 27

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[1] This town has not yet filed complete account.

Cities and Towns.	1912. Re-imbursement.	1913.				1914. Required Expenditure.
		Required Expenditure.	Total Net Expenditure.	Private Work.	Re-imbursement.	
New Salem, . . .	–	$148 72	–	–	–	$157 03
Newbury, . . .	$1,137 70*	627 06	$1,997 17	$687 61	$1,370 11*	604 09
Newburyport, . . .	–	5,000 00	–	–	–	5,000 00
Newton, ...	2,644 37*	5,000 00	25,032 88	16,942 86	2,000 00*	5,000 00
Norfolk, ...	236 44*	418 44	549 15	298 20	130 71*	479 03
North Andover, . .	364 58*	2,211 81	2,309 91	1,025 51	98 10*	2,229 00
North Attleborough, .	–	3,665 74	–	–	–	3,828 41
North Brookfield, . .	–	753 92	–	–	–	765 03
North Reading, . .	1,928 94*	354 10	2,632 48	780 52	2,278 38*	367 70
Northborough, . .	789 91*	566 66	1,245 03	383 68	78 37*	738 19
Northbridge, . . .	–	2,086 30	–	–	–	2,210 49
Norton, ...	–	601 74	–	–	–	675 10
Norwell, ...	403 35*	446 38	1,035 11	1,470 39	588 73*	462 94
Norwood, . . .	–	5,000 00	–	–	–	5,000 00
Oakham, ...	–	152 32	–	–	–	151 92
Orange, ...	–	1,652 94	–	–	–	1,622 09
Orleans, ...	–	765 33	–	–	–	1,478 52
Oxford, ...	–	820 58	–	–	–	825 79
Palmer, ...	–	1,934 07	–	–	–	2,115 60
Paxton, ...	–*	153 36	–	–	–	158 87
Peabody, ...	1,685 79	5,000 00	–	–	–	5,000 00
Pembroke, . . .	1,366 09*	390 54	1,846 51	353 76	1,455 97*	434 81
Pepperell, . . .	480 70*	907 45	1,912 19	484 90	1,004 74*	926 75
Petersham, . . .	–	442 07	–	–	–	444 69
Phillipston, . . .	–*	114 78	–	–	–	116 14
Plainville, . . .	–	342 66	–	–	–	414 68
Plymouth, . . .	–	4,886 83	–	–	–	5,000 00
Plympton, . . .	1,500 53*	166 36	1,670 26	204 83	1,503 90*	174 25
Princeton, . . .	–*	568 21	–	–	–*	596 48
Provincetown, . . .	–	915 41	–	–	–	944 17
Quincy, ...	–*	5,000 00	5,662 91	1,130 40	–*	5,000 00
Randolph, . . .	–	1,092 40	–	–	–	1,129 50
Raynham, . . .	452 11*	354 45	317 03	214 54	–*	365 10
Reading, ...	423 33*	2,618 75	3,151 64	1,997 70	133 33*	2,788 71
Rehoboth, . . .	–	385 80	–	–	–	411 04
Revere, ...	–	5,000 00	–	–	–	5,000 00
Rochester, . . .	–	379 92	–	–	–*	383 62

CITIES AND TOWNS.	1912. Re-imbursement.	1913.				1914. Required Expenditure.
		Required Expenditure.	Total Net Expenditure.	Private Work.	Re-imbursement.	
Rockland,	-	$1,931 05	-	-	-	$2,091 52
Rockport,	$446 56*	1,512 99	$1,826 71	$1,192 91	$313 72	1,563 59
Rowley,	698 07*	968 80	1,188 87	229 34	220 07*	919 07
Royalston,	-*	278 44	95 36	61 58	-*	288 25
Rutland,	-	312 59	-	-	-	342 78
Salem,	-	5,000 00	-	-	-	5,000 00
Salisbury,	1,265 29*	535 99	1,434 90	304 00	898 91*	571 86
Sandwich,	157 79*	473 83	769 64	115 00	295 81*	520 32
Saugus,	2,956 42*	2,537 20	4,976 05	2,466 83	1,798 32*	2,670 32
Scituate,	4,046 37*	2,052 80	6,297 85	1,600 00	3,045 05*	2,218 48
Seekonk,	-	635 77	-	-	-	659 45
Sharon,	-	1,287 25	-	-	-	1,487 41
Sherborn,	299 13	644 53	792 41	1,203 44	147 88*	892 70
Shirley,	-*	501 98	542 81	79 80	40 83*	505 28
Shrewsbury,	-*	960 50	-	-	-*	1,001 17
Somerset,	-	632 85	-	-	-	659 68
Somerville,	-	5,000 00	662 99	1,709 09	-	5,000 00
Southborough,	682 26*	822 60	1,323 52	987 04	-*	856 04
Spencer,	-	1,459 18	-	-	-	1,408 47
Springfield,	-	5,000 00	-	-	-	5,000 00
Sterling,	-*	493 86	490 28	245 19	-*	499 84
Stockbridge,	-	1,813 78	-	-	-	1,703 57
Stoneham,	-*	2,104 35	2,057 23	1,478 32	-*	2,140 83
Stoughton,	-*	1,557 35	-	-	-	1,610 80
Stow,	918 38*	424 82	1,204 67	410 25	779 85*	448 54
Sturbridge,	-	407 65	-	-	-	372 80
Sudbury,	880 62*	544 28	1,722 49	220 83	1,178 21*	558 91
Sutton,	-	618 05	-	-	-	611 92
Swampscott,	-	4,955 16	4,455 68	-	-	5,000 00
Swansea,	-	662 11	-	-	-	706 68
Taunton,	-	5,000 00	-	-	-	5,000 00
Templeton,	-	729 96	-	-	-*	734 77
Tewksbury,	594 76*	605 54	1,405 52	687 29	799 98*	645 83
Topsfield,	637 05*	1,243 95	1,581 50	730 56	337 55*	1,427 43
Townsend,	387 20*	538 96	1,620 65	447 88	1,081 69*	546 91
Truro,	-	157 91	-	-	-	163 22
Tyngsborough,	823 98*	262 14	1,599 63	907 78	737 49*	269 96

Cities and Towns.	1912.	1913.				1914.
	Re-imbursement.	Required Expenditure.	Total Net Expenditure.	Private Work.	Re-imbursement.	Required Expenditure.
Upton, ...	-	$474 22	-	-	-	$504 47
Uxbridge, . . .	-	1,413 00	-	-	-	1,503 98
Wakefield, . . .	-*	4,372 26	$1,129 86	$2,562 65	-*	4,602 40
Walpole, ...	-*	2,573 82	-	-	-	2,762 19
Waltham, . . .	$238 80*	5,000 00	7,297 71	5,875 19	$259 23*	5,000 00
Wareham, . . .	-	2,212 11	-	-	-	2,218 48
Warren, ...	-	840 79	-	-	-	979 44
Warwick, ...	-	165 89	-	-	-	182 51
Watertown, . . .	-	5,000 00	-	-	-	5,000 00
Wayland, ...	710 93*	1,270 83	1,514 16	1,205 00	243 33*	1,214 60
Webster, ...	-	3,482 36	-	-	-	2,851 88
Wellesley, . . .	370 11	5,000 00	4,624 98	1,351 45	-*	5,000 00
Wellfleet, ...	-	407 46	-	-	-	352 84
Wenham, . . .	987 04*	1,051 16	1,384 69	610 81	-*	1,064 16
West Boylston, . .	-	378 60	-	-	-	380 42
West Bridgewater, . .	-*	613 84	1,181 69	378 82	567 85*	621 62
West Newbury, . .	1,019 34*	423 04	1,375 24	385 85	952 20*	436 80
Westborough, . . .	-*	1,293 07	1,488 64	107 75	-*	1,309 46
Westford, . . .	1,429 95*	859 24	1,842 79	537 00	983 55*	882 21
Westminster, . . .	130 47*	377 73	987 82	197 03	610 09*	396 36
Weston, ...	615 46*	3,359 89	5,963 61	3,600 00	982 80*	3,248 27
Westport, . . .	-	883 26	-	-	-	912 68
Westwood, . . .	-*	1,641 04	-	-	-	1,640 03
Weymouth, . . .	8 99	3,982 86	4,290 61	1,987 02	-*	4,587 23
Whitman, . . .	-	2,215 37	-	-	-	2,229 69
Wilbraham, . . .	-	471 26	-	-	-*	489 82
Wilmington, . . .	2,052 16*	683 73	2,970 17	894 72	1,686 44*	726 89
Winchendon, . . .	-	1,683 77	1,831 59	204 11	147 82*	1,720 71
Winchester, . . .	-*	5,000 00	3,746 79	-	-	5,000 00
Winthrop, . . .	-	5,000 00	-	-	-	5,000 00
Woburn, ...	3,025 92	4,660 11	9,550 55	2,069 28	4,628 61*	4,828 12
Worcester, . . .	-	5,000 00	-	-	-	5,000 00
Wrentham, . . .	-	560 48	-	-	-	587 68
Yarmouth, . . .	-	989 19	-	-	-	1,020 00

Summary of Recommendations of the State Forester.

1. That a more pretentious plan for acquisition and management of lands for use as State forests be given due consideration.

2. That legislation be enacted regulating the present slash dangers. Our great losses from forest fires are largely traceable to our indifference in leaving slash where it can be reached by fire.

3. That the appropriation for gypsy and brown-tail moths for the coming year be as follows: $125,000 for the remainder of this year and $75,000 for use until the Legislature of 1915 may take action.

4. That the present method of taxing forest land be so altered as to encourage rather than discourage the practice of forestry in this Commonwealth.

Respectfully submitted,

F. W. RANE,
State Forester.

FINANCIAL RETURNS

AND

ANALYSIS OF PREMIUMS AND GRATUITIES

OF THE

INCORPORATED SOCIETIES,

WITH

MEMBERSHIP AND INSTITUTES,

FOR THE YEAR 1913.

FINANCIAL RETURNS OF THE INCORPORATED

	SOCIETIES.	When incorporated.	Amount originally raised by Contribution. (R. L. 124, Sects. 1 and 3.)	Amount now held invested as Capital Stock. (R. L. 124, Sects. 3 and 12.)	Total Assets.	Real Estate.	Notes.
1	Amesbury and Salisbury (Agricultural and Horticultural), . .	1881	$1,002 32	[1] $8,221 69	$8,221 69	$7,716 69	–
2	Barnstable County, ...	1844	1,740 00	[2] 11,648 20	12,046 99	9,000 00	–
3	Blackstone Valley, ...	1884	3,000 00	[4] 9,546 65	9,546 65	8,700 00	–
4	Deerfield Valley, ...	1871	4,094 01	[1] 9,750 00	10,098 21	9,500 00	–
5	Eastern Hampden, ...	1856	3,000 00	[1] 19,850 00	20,301 68	19,550 00	–
6	Essex,.	1818	4,527 20	[5] 5,812 17	5,812 17	–	[6]$5,150 00
7	Franklin County, ...	1850	1,000 00	[7] 17,355 29	17,355 29	16,025 00	–
8	Hampshire, ...	1814	3,255 26	[1] 5,825 00	5,986 56	5,775 00	–
9	Hampshire, Franklin and Hampden,	1818	8,141 29	[1] 29,110 00	29,731 06	28,610 00	–
10	Highland, ...	1859	3,262 00	[1] 3,120 00	3,309 69	3,000 00	–
11	Hillside, ...	1883	3,113 32	[8] 5,718 64	5,718 64	5,250 00	–
12	Hingham (Agricultural and Horticultural), ...	1867	17,406 15	[8] 4,231 99	4,231 99	2,500 00	–
13	Hoosac Valley, ...	1860	2,006 00	[9] 15,000 00	15,252 87	15,000 00	–
14	Housatonic, ...	1848	6,335 33	[7] 29,670 33	29,670 33	24,849 37	–
15	Lenox Horticultural, . . .	1910	2,103 33	[10] 2,672 41	3,070 41	–	–
16	Marshfield (Agricultural and Horticultural), ...	1867	3,755 33	[8] 16,750 00	18,749 39	14,000 00	–
17	Martha's Vineyard, ...	1859	4,552 17	[11] 4,607 55	4,690 65	2,750 00	80 00
18	Massachusetts Horticultural, . .	1829	525 00	[12] 841,175 10	847,418 18	518,564 63	–
19	Massachusetts Society for Promoting Agriculture,[14].	1792	–	–	–	–	–
20	Middlesex North, ...	1855	3,000 00	[15] 6,878 34	6,878 34	–	3,504 80
21	Middlesex South, ...	1854	3,000 00	[1] 15,200 00	15,371 38	15,000 00	–
22	Nantucket, ...	1856	3,500 00	[4] 3,366 95	3,366 95	3,200 00	–
23	Oxford, ...	1888	4,400 00	[8] 11,718 08	11,718 08	11,000 00	–
24	Plymouth County, ...	1819	800 00	[10] 2,151 44	2,151 44	–	–
25	Quannapowitt, ...	1909	1,000 00	[1] 34,150 00	34,199 09	33,800 00	–
26	Spencer (Farmers' and Mechanics' Association), ...	1888	4,034 00	[1] 10,350 00	10,358 24	9,400 00	–
27	Union (Agricultural and Horticultural), ...	1867	4,447 23	[1] 9,000 00	9,276 63	8,000 00	–
28	West Taunton, ...	1913	100 29	[10] 1,060 73	1,060 73	–	–
29	Weymouth (Agricultural and Industrial), ...	1891	10,270 00	[1] 15,450 00	15,700 55	15,000 00	–
30	Worcester, ...	1818	7,730 00	[8] 103,587 82	103,587 82	85,000 00	–
31	Worcester East, ...	1890	2,296 23	[1] 12,491 30	12,780 04	11,534 00	–
32	Worcester North (Agricultural and Driving Association), ...	1913	3,602 63	[9] 23,848 44	25,171 74	23,848 44	–
33	Worcester Northwest (Agricultural and Mechanical Association), .	1867	3,400 00	[8] 13,312 65	13,312 65	13,000 00	–
34	Worcester South, ...	1855	3,127 40	[8] 22,191 43	22,191 43	20,850 00	–
35	Worcester County West, . . .	1851	3,175 00	[1] 10,500 00	10,573 67	10,000 00	–
			$130,701 49	$1,305,322 20	$1,308,911 23	$942,323 13	$8,734 80

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[1] Invested in real estate, crockery, tables, etc.

[2] Invested in real estate, trust funds, crockery, tables, etc.

[3] Trust funds.

[4] Invested in real estate and bank funds.

[5] Invested in stocks, mortgage, bank funds, crockery, tables, etc.

[6] Mortgage.

[7] Invested in real estate, stocks, bank funds, crockery, tables, etc.

[8] Invested in real estate, bank funds, crockery, tables, etc.

Societies for the Year ending Dec. 31, 1913.

Stocks and Bonds.	Bank Funds.	Crockery, Tables, etc.	Bills due and unpaid.	Cash on Hand.	Total Liabilities.	Premiums due and unpaid.	Outstanding Bills.	Mortgages or Like Liabilities.	Total Receipts.	
-	-	$505 00	-	-	$1,765 99	-	-	$1,765 99	$3,083 65	1
-	[3] $2,078 20	570 00	-	$398 79	3,566 15	$141 15	$25 00	3,400 00	12,037 24	2
-	846 65	-	-	-	2,500 00	-	-	2,500 00	4,105 90	3
-	-	250 00	$124 85	223 36	500 00	-	-	500 00	2,954 45	4
-	-	300 00	211 50	240 18	7,390 51	-	315 45	7,075 06	7,126 06	5
$90 00	372 17	200 00	-	-	2,000 00	-	-	2,000 00	13,732 95	6
1,000 00	80 29	250 00	-	-	1,850 00	-	300 00	1,550 00	9,098 12	7
-	-	50 00	-	161 56	2,250 00	-	-	2,250 00	3,566 50	8
-	-	500 00	-	621 06	3,600 00	-	-	3,600 00	12,549 54	9
-	-	120 00	-	189 69	-	-	-	-	1,745 73	10
-	103 64	365 00	-	-	300 00	-	300 00	-	2,539 62	11
-	831 99	900 00	-	-	-	-	-	-	912 88	12
-	-	-	-	252 87	9,532 23	-	532 23	9,000 00	7,443 96	13
500 00	1,000 00	425 00	-	2,895 96	50 00	-	50 00	-	15,644 77	14
-	2,272 41	400 00	-	398 00	-	-	-	-	1,492 24	15
-	20 50	700 00	-	1,999 39	2,510 90	10 90	-	2,500 00	10,672 67	16
-	1,577 55	200 00	4 00	79 10	60 00	-	60 00	-	1,438 72	17
268,000 00	-	[13] 54,610 47	-	6,243 08	-	-	-	-	23,000 14	18
-	-	-	-	-	-	-	-	-	-	19
-	3,373 54	-	-	-	-	-	-	-	1,178 02	20
-	-	200 00	-	171 38	12,650 00	-	-	12,650 00	8,316 83	21
-	166 95	-	-	-	-	-	-	-	1,693 66	22
-	-	632 60	-	85 48	3,080 00	-	-	3,080 00	4,648 94	23
-	2,151 44	39 00	-	-	-	-	-	-	606 58	24
-	-	350 00	-	49 09	15,684 32	-	2,684 32	13,000 00	5,917 82	25
-	-	950 00	-	8 24	3,100 98	-	1,300 98	1,800 00	2,003 94	26
-	-	1,000 00	-	276 63	932 00	32 00	-	900 00	2,888 42	27
-	715 73	345 00	-	115 73	-	-	-	-	1,606 95	28
-	-	450 00	-	250 55	4,358 77	-	258 77	4,100 00	4,635 75	29
-	11,286 81	1,938 36	-	5,362 65	1,196 43	-	1,196 43	-	43,808 23	30
-	-	957 30	-	288 74	-	-	-	-	11,501 81	31
-	-	-	1,000 00	323 30	20,000 00	-	-	20,000 00	30,383 59	32
-	12 65	300 00	-	-	4,969 00	23 50	52 75	4,892 75	11,349 53	33
-	-	1,100 00	-	241 43	1,085 00	300 00	85 00	700 00	7,934 68	34
-	-	500 00	-	73 67	421 15	66 00	355 15	-	4,833 83	35
$269,590 00	$26,890 52	$69,107 73	$1,340 35	$20,949 93	$105,353 43	$573 55	$7,516 08	$97,263 80	$276,453 72	

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[9] Invested in real estate.

[10] Invested in bank funds, crockery, tables, etc.

[11] Invested in real estate, notes, bank funds, crockery, tables, etc.

[12] Invested in real estate, library, stocks, bonds, crockery, tables, etc.

[13] Includes library valued at $45,110.47.

[14] Represented on the Board by special enactment, and makes no returns.

[15] Invested in notes and bank funds.

FINANCIAL RETURNS OF THE INCORPORATED SOCIETIES

	SOCIETIES.	Bounty.	Income from Notes and Bank Funds.	Income from Stocks and Bonds.	New Members.	Donations.	Entry Fees.	Gate Receipts.
1	Amesbury and Salisbury (Agricultural and Horticultural), . .	$846 45	–	–	$11 50	$30 65	–	$1,357 05
2	Barnstable County, ...	834 60	$36 00	–	15 00	40 00	$826 80	5,940 75
3	Blackstone Valley, ...	800 85	–	–	28 00	50 45	119 00	1,543 10
4	Deerfield Valley, ...	848 05	–	–	35 00	–	202 50	1,457 10
5	Eastern Hampden, ...	875 50	–	–	83 00	–	776 00	3,753 55
6	Essex, ...	864 25	8 07	–	6 00	6 00	112 25	1,491 91
7	Franklin County, ...	822 75	–	$45 00	–	–	395 00	4,461 85
8	Hampshire, ...	999 00	–	–	62 50	274 61	402 50	797 55
9	Hampshire, Franklin and Hampden, ...	914 00	–	–	60 00	–	480 00	6,874 85
10	Highland, ...	849 10	–	–	29 00	1 25	58 40	246 20
11	Hillside, ...	905 85	1 34	–	82 00	–	58 00	633 67
12	Hingham (Agricultural and Horticultural), ...	608 30	29 78	–	–	23 80	–	–
13	Hoosac Valley, ...	574 60	–	–	10 00	5 00	439 00	4,189 31
14	Housatonic, ...	911 00	30 20	25 00	324 00	–	1,452 62	5,805 95
15	Lenox Horticultural, ...	735 29	88 20	–	7 00	290 00	–	.371 75
16	Marshfield (Agricultural and Horticultural), ...	864 30	50 20	–	105 00	65 50	1,295 00	6,005 50
17	Martha's Vineyard, ...	800 00	69 43	–	4 00	94	–	240 30
18	Massachusetts Horticultural, . .	1,000 00	–	12,345 00	932 00	27 90	–	2,567 60
19	Massachusetts Society for Promoting Agriculture,[4]	–	–	–	–	–	–	–
20	Middlesex North, ...	840 15	286 87	–	51 00	–	–	–
21	Middlesex South, ...	1,000 00	–	–	5 00	1,146 17	582 06	1,132 90
22	Nantucket, ...	798 50	–	–	37 00	2 40	99 00	605 75
23	Oxford, ...	857 50	–	–	21 00	–	582 45	1,357 35
24	Plymouth County, ...	434 61	95 82	–	–	26 15	–	–
25	Quannapowitt, ...	800 00	–	–	23 00	150 00	–	3,245 50
26	Spencer (Farmers' and Mechanics' Association), ...	744 26	–	–	18 00	30 75	57 70	813 75
27	Union (Agricultural and Horticultural), ...	846 73	–	–	36 00	28 00	210 50	861 00
28	West Taunton, ...	–	–	–	750 00	139 25	–	277 79
29	Weymouth (Agricultural and Industrial), ...	638 95	–	–	20 00	24 35	309 75	2,478 00
30	Worcester, ...	892 50	565 66	–	115 00	443 00	3,279 78	21,144 45
31	Worcester East, ...	937 75	–	–	43 00	2,100 00	18 91	4,541 65
32	Worcester North (Agricultural and Driving Association), ...	749 34	–	–	250 00	416 90	–	3,870 75
33	Worcester Northwest (Agricultural and Mechanical Association), .	868 00	–	–	15 00	5 00	881 00	5,017 00
34	Worcester South, ...	862 75	–	–	43 00	–	550 30	4,008 00
35	Worcester County West, . . .	882 25	–	–	–	–	65 30	2,660 50
		$27,207 18	$1,261 57	$12,415 00	$3,221 00	$5,328 07	$13,253 82	$99,752 38

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[1] Includes $9,600 received from sale of fair grounds.

[2] Includes $9,600 expended to cancel mortgage on fair grounds.

[3] Includes money expended for medals.

FOR THE YEAR ENDING DEC. 31, 1913 — *Concluded.*

Grand Stand Receipts.	Concessions and Rentals.	All Other Sources.	Total Expenditures.	Premiums and Gratuities paid.	New Buildings and Repairs.	Current Running Expenses.	Farmers' Institutes.	Interest.	All Other Expenses.	
-	$433 65	$404 35	$3,133 15	$1,031 80	$306 13	$611 69	$10 18	$87 98	$1,085 37	1
$1,735 40	1,137 00	1,471 69	11,638 45	1,134 70	622 19	5,909 41	18 00	192 00	3,762 15	2
1,116 00	161 00	287 50	3,644 62	842 80	360 78	1,954 57	-	155 00	331 47	3
127 50	250 50	33 80	2,816 34	1,633 85	215 04	747 03	5 50	30 00	184 92	4
604 15	954 21	79 65	6,962 65	2,920 32	435 56	2,854 79	-	272 30	479 68	5
-	389 47	[1] 10,855 00	[2] 13,433 65	1,078 95	180 71	459 55	-	581 37	1,533 07	6
704 55	762 00	1,906 97	9,429 94	2,884 60	1,394 54	4,014 59	7 00	66 65	1,062 56	7
61 15	159 00	810 19	3,355 99	951 25	253 57	833 90	-	120 00	1,197 27	8
1,204 95	2,356 16	659 58	11,936 48	3,256 86	1,244 38	4,223 31	20 00	270 00	2,921 93	9
-	64 01	497 77	1,556 04	932 35	-	391 44	-	7 25	225 00	10
52 00	220 50	586 26	2,732 84	1,264 35	218 48	1,239 07	6 75	4 19	-	11
-	-	251 00	1,170 09	750 55	81 62	337 92	-	-	-	12
510 25	503 60	1,212 20	7,191 09	687 45	-	6,278 64	-	225 00	-	13
2,384 25	2.897 75	1,814 00	14,824 97	6,437 25	762 06	-	37 28	1,050 00	6,538 38	14
-	-	-	1,592 12	1,016 25	-	575 87	-	-	-	15
660 00	721 40	905 77	10,580 66	1,188 69	1,499 89	7,304 68	45 00	100 00	442 40	16
-	207 50	116 55	1,719 45	864 38	279 07	330 00	-	-	246 00	17
-	6,127 64	-	27,723 10	[3] 6,870 19	4,148 29	16,704 62	-	-	-	18
-	-	-	-	-	-	-	-	-	-	19
-	-	-	1,155 82	860 05	-	230 60	65 17	-	-	20
34 00	347 50	4,069 20	8,145 45	1,880 95	1,583 87	1,162 52	-	722 47	2,795 64	21
36 75	55 38	58 88	1,227 28	846 00	48 59	93 24	19 25	2 00	218 20	22
359 00	441 50	1,030 14	4,663 56	2,277 55	60 00	1,120 00	7 00	134 00	1,065 01	23
-	-	50 00	611 03	506 55	-	104 48	-	-	-	24
448 00	272 01	979 31	5,917 82	1,364 81	709 95	3,793 06	-	50 00	-	25
84 70	163 50	91 28	1,995 70	1,127 53	-	-	4 00	-	864 17	26
44 75	255 49	605 95	2,604 41	1,376 63	246 71	800 48	99 89	45 00	35 70	27
-	-	439 91	546 22	215 85	-	127 01	-	-	203 36	28
216 00	574 65	374 05	5,307 93	1,021 05	647 10	2,855 03	-	175 00	609 75	29
5,182 40	6,555 96	5,629 48	38,851 81	10,447 81	4,669 52	22,290 62	25 00	50 00	1,368 86	30
1,199 38	951 80	1,709 32	11,213 07	2,878 05	823 00	5,683 11	13 75	-	1,815 16	31
-	639 26	[4] 24,296 95	30,060 29	1,224 25	13,449 89	75 44	70 15	416 58	14,823 98	32
901 00	649 75	3,012 78	10.481 63	1,831 93	-	8,336 70	-	313 00	-	33
899 00	685 25	886 38	8,352 48	2,787 94	700 24	1,844 52	10 00	35 00	2,974 78	34
316 70	262 65	646 43	4,760 16	1,651 10	775 84	2,331 47	1 75	-	-	35
$18,881 88	$29,200 00	$65,772 14	$271,336 29	$68,044 64	$35,717 02	$105,619 36	$465 67	$5,104 79	$46,784 81	

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[4] Represented on the Board by special enactment, and makes no returns.

[5] Includes loan of $20,000 secured by mortgage on real estate.

ANALYSIS OF GENERAL PREMIUMS AND GRATUITIES OFFERED, ENDING DEC. 31, 1913;

	SOCIETIES.	Total Amount offered in Premiums.	Total Amount awarded in Premiums and Gratuities.	Total Amount paid in Premiums and Gratuities.
1	Amesbury and Salisbury (Agricultural and Horticultural),	$1,799 10	$905 05	$905 05
2	Barnstable County,	1,824 50	1,127 35	986 20
3	Blackstone Valley,	1,593 70	768 45	718 00
4	Deerfield Valley,	1,301 50	973 00	973 00
5	Eastern Hampden,	1,779 25	1,073 65	1,043 82
6	Essex,	1,786 50	903 75	902 00
7	Franklin County,	2,799 70	1,586 30	1,586 30
8	Hampshire,	1,755 75	741 00	741 00
9	Hampshire, Franklin and Hampden,	2,485 00	1,712 00	1,712 00
10	Highland,	885 75	716 65	716 65
11	Hillside,	1,232 00	1,002 30	1,002 30
12	Hingham (Agricultural and Horticultural),	1,279 75	675 05	675 05
13	Hoosac Valley,	2,506 25	659 95	505 95
14	Housatonic,	3,083 25	2,560 50	2,560 50
15	Lenox Horticultural,	1,186 00	910 00	910 00
16	Marshfield (Agricultural and Horticultural),	1,314 00	1,000 88	1,000 88
17	Martha's Vineyard,	941 35	802 23	802 23
18	Massachusetts Horticultural,	8,845 00	6,560 00	6,560 00
19	Massachusetts Society for Promoting Agriculture,[1]	–	–	–
20	Middlesex North,	878 00	662 80	662 80
21	Middlesex South,	2,174 45	1,128 45	1,128 45
22	Nantucket,	1,129 25	810 50	810 50
23	Oxford,	1,524 20	981 95	981 95
24	Plymouth County,	511 50	457 20	440 05
25	Quannapowitt,	1,310 50	1,000 11	1,000 11
26	Spencer (Farmers' and Mechanics' Association),	1,215 00	731 28	731 28
27	Union (Agricultural and Horticultural),	1,360 65	784 74	771 63
28	West Taunton,	217 50	202 35	202 35
29	Weymouth (Agricultural and Industrial),	1,570 00	810 25	810 25
30	Worcester,	9,527 75	6,381 00	6,381 00
31	Worcester East,	3,643 35	2,625 30	2,625 30
32	Worcester North (Agricultural and Driving Association),	1,645 85	1,080 65	1,080 65
33	Worcester Northwest (Agricultural and Mechanical Association),	2,568 00	1,648 18	1,625 68
34	Worcester South,	1,864 35	1,250 79	1,100 00
35	Worcester County West,	1,885 30	1,010 95	944 95
		$71,424 00	$46,244 61	$45,597 88

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[1] Represented on the Board by special enactment, and makes no returns.

AWARDED AND PAID, AND INSTITUTES HELD, IN THE YEAR
ALSO MEMBERSHIP.

Amount offered under Head of Farms, etc.	Amount awarded under Head of Farms, etc.	Amount paid under Head of Farms, etc.	Amount offered under Head of Farm and Pet Stock.	Amount awarded under Head of Farm and Pet Stock.	Amount paid under Head of Farm and Pet Stock.	Amount offered under Head of Field and Garden Crops.	Amount awarded under Head of Field and Garden Crops.	Amount paid under Head of Field and Garden Crops.	
–	–	–	$1,223 00	$472 50	$472 50	–	–	–	1
$64 00	–	–	969 00	497 75	397 00	$93 00	–	–	2
47 00	$44 00	$44 00	1,262 50	541 00	500 50	–	–	–	3
186 00	186 00	186 00	922 00	614 75	614 75	–	–	–	4
291 00	180 00	177 25	1,026 00	527 75	515 95	–	–	–	5
76 00	34 00	34 00	834 00	389 75	388 50	176 00	–	–	6
51 00	51 00	51 00	2,070 00	997 25	997 25	–	–	–	7
46 00	36 00	36 00	1,455 00	537 00	537 00	–	–	–	8
195 00	195 00	195 00	1,764 00	1,164 50	1,164 50	–	–	–	9
–	–	–	634 00	544 50	544 50	29 00	$17 00	$17 00	10
23 00	23 00	23 00	867 00	681 50	681 50	52 00	52 00	52 00	11
118 75	31 00	31 00	–	–	–	203 50	66 00	66 00	12
–	–	–	1,849 00	366 50	212 50	–	–	–	13
–	–	–	1,635 00	1,378 00	1,378 00	272 00	252 00	252 00	14
50 00	–	–	–	–	–	–	–	–	15
100 00	–	–	682 50	538 99	538 99	67 50	–	–	16
17 00	–	–	606 00	397 75	397 75	–	–	–	17
–	–	–	–	–	–	–	–	–	18
–	–	–	–	–	–	–	–	–	19
–	–	–	380 00	279 25	279 25	–	–	–	20
107 00	61 00	61 00	1,460 50	820 00	820 00	[2] –	–	–	21
74 00	60 00	60 00	604 75	493 50	493 50	104 00	13 00	13 00	22
60 00	29 00	29 00	1,165 50	757 50	757 50	–	–	–	23
20 00	24 00	24 00	180 50	182 75	182 75	–	–	–	24
36 00	36 00	36 00	490 00	272 86	272 86	–	–	–	25
134 00	58 00	58 00	762 00	480 25	480 25	–	–	–	26
110 00	106 00	106 00	934 50	457 25	451 25	–	–	–	27
–	–	–	65 25	57 00	57 00	–	–	–	28
–	–	–	1,136 25	608 15	608 15	–	–	–	29
–	–	–	8,363 00	5,442 50	5,442 50	–	–	–	30
53 00	53 00	53 00	2,130 00	1,422 75	1,422 75	–	–	–	31
–	–	–	1,275 50	865 75	865 75	–	–	–	32
–	–	–	1,767 00	1,037 50	1,028 00	–	–	–	33
259 00	172 00	172 00	1,211 00	766 75	615 75	–	–	–	34
108 00	74 00	74 00	1,466 00	721 75	655 75	–	–	–	35
$2,225 75	$1,453 00	$1,450 25	$41,190 75	$24,315 00	$23,774 20	$997 00	$400 00	$400 00	

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[2] Silver and bronze cups offered for experimental crops.

Analysis of General Premiums and Gratuities offered, ending Dec. 31, 1913;

	SOCIETIES.	Amount offered under Head of Farm and Garden Products.	Amount awarded under Head of Farm and Garden Products.	Amount paid under Head of Farm and Garden Products.	Amount offered under Head of Dairy Products.	Amount awarded under Head of Dairy Products.	Amount paid under Head of Dairy Products.
1	Amesbury and Salisbury (Agricultural and Horticultural),	$284 10	$182 55	$182 55	$3 25	$3 25	$3 25
2	Barnstable County,	489 25	363 30	344 25	11 00	5 00	5 00
3	Blackstone Valley,	130 45	101 45	100 00	10 00	5 00	5 00
4	Deerfield Valley,	83 50	68 60	68 60	12 00	6 00	6 00
5	Eastern Hampden,	270 25	229 50	217 22	32 00	20 00	19 50
6	Essex,	380 25	249 00	249 00	14 00	7 00	7 00
7	Franklin County,	318 95	243 75	243 75	22 00	9 00	9 00
8	Hampshire,	173 50	120 75	120 75	6 00	1 50	1 50
9	Hampshire, Franklin and Hampden,	302 00	214 00	214 00	36 00	16 00	16 00
10	Highland,	79 20	49 70	49 70	5 00	5 00	5 00
11	Hillside,	118 00	103 00	103 00	6 00	3 00	3 00
12	Hingham (Agricultural and Horticultural),	799 25	425 80	425 80	3 50	2 00	2 00
13	Hoosac Valley,	137 50	79 75	79 75	18 00	6 00	6 00
14	Housatonic,	372 75	313 50	313 50	38 00	38 00	38 00
15	Lenox Horticultural,	1,136 00	910 00	910 00	–	–	–
16	Marshfield (Agricultural and Horticultural),	241 00	243 40	238 60	13 00	3 50	3 50
17	Martha's Vineyard,	107 00	147 65	147 65	10 00	8 75	8 75
18	Massachusetts Horticultural,	8,845 00	6,560 00	6,560 00	–	–	–
19	Massachusetts Society for Promoting Agriculture,[1]	–	–	–	–	–	–
20	Middlesex North,	303 40	260 05	260 05	–	–	–
21	Middlesex South,	431 75	123 25	123 25	–	–	–
22	Nantucket,	211 00	95 50	95 50	16 00	–	–
23	Oxford,	125 25	82 75	82 75	12 00	3 00	3 00
24	Plymouth County,	144 50	118 70	109 20	–	–	–
25	Quannapowitt,	147 00	124 75	124 75	–	–	–
26	Spencer (Farmers' and Mechanics' Association),	179 75	106 50	106 50	10 00	10 00	10 00
27	Union (Agricultural and Horticultural),	160 00	102 04	102 04	13 25	5 75	5 75
28	West Taunton,	131 50	122 30	122 30	75	–	–
29	Weymouth (Agricultural and Industrial),	222 25	95 85	95 85	5 50	–	–
30	Worcester,	766 50	603 50	603 50	22 00	7 00	7 00
31	Worcester East,	1,031 25	900 25	900 25	16 00	3 00	3 00
32	Worcester North (Agricultural and Driving Association),	252 25	189 25	189 25	–	–	–
33	Worcester Northwest (Agricultural and Mechanical Association),	392 00	307 00	301 00	11 00	7 00	7 00
34	Worcester South,	182 50	133 39	133 39	20 00	17 00	17 00
35	Worcester County West,	168 00	110 65	110 65	14 00	7 00	7 00
		$19,116 85	$14,081 43	$14,028 35	$380 25	$198 75	$198 25

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[1] Represented on the Board by special enactment, and makes no returns.

AWARDED AND PAID, AND INSTITUTES HELD, IN THE YEAR ALSO MEMBERSHIP — *Continued.*

Amount offered under Head of Domestic Manufactures.	Amount awarded under Head of Domestic Manufactures.	Amount paid under Head of Domestic Manufactures.	Amount offered under Head of Agricultural Implements.	Amount awarded under Head of Agricultural Implements.	Amount paid under Head of Agricultural Implements.	Amount offered under Head of Grange Exhibits.	Amount awarded under Head of Grange Exhibits.	Amount paid under Head of Grange Exhibits.	
$152 75	$143 75	$143 75	–	–	–	$90 00	$70 00	$70 00	1
198 25	261 30	239 95	–	–	–	–	–	–	2
113 75	56 50	48 50	–	–	–	30 00	20 00	20 00	3
93 00	92 65	92 65	–	–	–	–	–	–	4
97 00	81 40	78 90	–	–	–	45 00	30 00	30 00	5
113 25	54 00	53 50	$28 00	$5 00	$5 00	165 00	165 00	165 00	6
91 75	98 55	98 55	–	–	–	150 00	155 00	155 00	7
75 25	45 75	45 75	–	–	–	–	–	–	8
163 00	107 50	107 50	–	–	–	25 00	15 00	15 00	9
138 55	100 45	100 45	–	–	–	–	–	–	10
166 00	139 80	139 80	–	–	–	–	–	–	11
145 75	146 25	146 25	–	–	–	–	–	–	12
495 75	207 70	207 70	6 00	–	–	–	–	–	13
690 50	554 00	554 00	–	–	–	75 00	25 00	25 00	14
–	–	–	–	–	–	–	–	–	15
210 00	215 80	211 65	–	–	–	–	–	–	16
156 75	203 48	203 48	–	–	–	–	–	–	17
–	–	–	–	–	–	–	–	–	18
–	–	–	–	–	–	–	–	–	19
94 60	83 50	83 50	–	–	–	100 00	40 00	40 00	20
85 20	64 20	64 20	–	–	–	90 00	60 00	60 00	21
119 50	148 50	148 50	–	–	–	–	–	–	22
111 45	69 70	69 70	–	–	–	50 00	40 00	40 00	23
116 50	91 75	84 10	–	–	–	50 00	40 00	40 00	24
100 00	83 00	83 00	–	–	–	512 50	472 50	472 50	25
104 25	51 53	51 53	25 00	25 00	25 00	–	–	–	26
142 90	113 70	106 59	–	–	–	–	–	–	27
20 00	23 05	23 05	–	–	–	–	–	–	28
206 00	106 25	106 25	–	–	–	–	–	–	29
126 25	103 00	103 00	–	–	–	250 00	225 00	225 00	30
403 10	236 30	236 30	10 00	10 00	10 00	–	–	–	31
48 10	25 65	25 65	–	–	–	70 00	–	–	32
178 00	76 68	69 68	–	–	–	220 00	220 00	220 00	33
127 35	96 65	96 65	–	–	–	65 00	65 00	65 00	34
119 30	87 55	87 55	10 00	10 00	10 00	–	–	–	35
$5,203 80	$3,969 89	$3,911 63	$79 00	$50 00	$50 00	$1,987 50	$1,642 50	$1,642 50	

ANALYSIS OF GENERAL PREMIUMS AND GRATUITIES OFFERED, ENDING DEC. 31, 1913;

	SOCIETIES.	Amount offered for All Other Objects, Strictly Agricultural.	Amount awarded for All Other Objects, Strictly Agricultural.	Amount paid for All Other Objects, Strictly Agricultural.	Amount received in Entry Fees for Trotting.	Amount paid for Trotting.	Amount paid for Sports and Games.
1	Amesbury and Salisbury (Agricultural and Horticultural),	$16 00	$33 00	$33 00	–	–	$470 52
2	Barnstable County,	–	–	–	$772 50	$1,882 50	891 91
3	Blackstone Valley,	–	–	–	80 00	587 25	3 75
4	Deerfield Valley,	5 00	5 00	5 00	202 50	530 00	6 00
5	Eastern Hampden,	18 00	–	–	765 00	1,680 00	85 00
6	Essex,	–	–	–	–	–	35 00
7	Franklin County,	96 00	31 00	31 00	395 00	1,080 00	55 00
8	Hampshire,	–	–	–	402 50	852 00	35 65
9	Hampshire, Franklin and Hampden,	–	–	–	480 00	1,350 00	–
10	Highland,	–	–	–	28 00	70 00	–
11	Hillside,	–	–	–	28 00	62 00	–
12	Hingham (Agricultural and Horticultural),	9 00	4 00	4 00	–	–	–
13	Hoosac Valley,	–	–	–	439 00	[1] 1,790 00	–
14	Housatonic,	–	–	–	1,360 00	3,550 00	–
15	Lenox Horticultural,	–	–	–	–	–	–
16	Marshfield (Agricultural and Horticultural),	–	–	–	1,200 00	1,970 00	–
17	Martha's Vineyard,	44 60	44 60	44 60	–	–	44 60
18	Massachusetts Horticultural,	–	–	–	–	–	–
19	Massachusetts Society for Promoting Agriculture,[3]	–	–	–	–	–	–
20	Middlesex North,	–	–	–	–	–	–
21	Middlesex South,	–	–	–	215 00	550 00	–
22	Nantucket,	–	–	–	13 00	130 00	–
23	Oxford,	–	–	–	544 00	1,190 00	–
24	Plymouth County,	–	–	–	–	–	–
25	Quannapowitt,	25 00	11 00	11 00	420 00	1,394 19	546 75
26	Spencer (Farmers' and Mechanics' Association),	–	–	–	15 00	275 00	–
27	Union (Agricultural and Horticultural),	–	–	–	168 00	510 00	25 50
28	West Taunton,	–	–	–	–	–	–
29	Weymouth (Agricultural and Industrial),	–	–	–	260 00	760 00	359 92
30	Worcester,	–	–	–	1,832 00	3,891 56	803 24
31	Worcester East,	–	–	–	1,195 00	2,000 00	25 00
32	Worcester North (Agricultural and Driving Association),	–	–	–	–	–	202 29
33	Worcester Northwest (Agricultural and Mechanical Association),	–	–	–	881 10	2,140 00	–
34	Worcester South,	–	–	–	510 00	1,515 00	178 73
35	Worcester County West,	–	–	–	61 00	566 25	75 00
		$243 60	$128 60	$128 60	$12,266 60	$30,325 75	$3,843 86

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[1] Includes $90 paid in premiums for trotters and pacers.

[2] Estimated.

[3] Represented on the Board by special enactment, and makes no returns.

AWARDED AND PAID, AND INSTITUTES HELD, IN THE YEAR ALSO MEMBERSHIP — *Concluded.*

Amount paid for Other Attractions.	Number of Persons receiving Premiums.	Number of Persons receiving Gratuities.	Number of Cities and Towns where Premiums were paid.	Amount paid to Parties outside the State.	Number of Male Members.	Number of Female Members.	Total Membership.	Number of Institute Sessions held.	Average Attendance per Session.	
$307 50	332	–	13	$67 75	201	33	234	6	33	1
705 00	198	140	14	–	200	163	363	5	71	2
83 24	162	15	10	–	280	238	518	2	64	3
–	250	–	19	23 15	972	262	1,234	3	133	4
1,145 60	199	–	26	15 00	296	174	470	1	60	5
50 00	253	17	23	–	732	17	749	7	123	6
765 00	263	56	14	16 00	1,400	100	1,500	4	90	7
123 00	89	13	12	–	440	187	627	2	103	8
2,154 87	481	–	33	–	697	265	962	3	138	9
–	199	–	21	–	241	133	374	3	49	10
–	603	–	15	–	938	54	992	2	85	11
–	115	180	4	–	340	134	474	3	178	12
886 00	193	2	4	28 00	377	15	392	2	38	13
1,399 66	816	25	13	390 75	1,860	85	1,945	7	114	14
–	52	–	5	–	126	18	144	3	101	15
1,029 00	[2] 175	[2] 150	29	2 75	498	296	794	6	69	16
35 00	90	127	6	–	64	74	138	3	39	17
–	264	177	82	592 00	698	145	843	9	141	18
–	–	–	–	–	–	–	–	–	–	19
–	174	19	16	–	541	227	768	10	197	20
332 00	127	4	30	–	[4] –	[4] –	500	3	108	21
–	217	38	1	–	217	428	645	4	65	22
653 55	150	–	12	–	331	261	592	3	41	23
–	257	39	12	–	610	512	1,122	3	116	24
[5] 252 50	204	–	21	–	33	–	33	2	238	25
100 00	174	–	17	–	419	414	833	3	38	26
–	161	64	20	125 00	683	870	1,553	3	187	27
–	125	42	7	–	44	11	55	–	–	28
450 00	388	11	18	–	482	10	492	3	63	29
4,818 05	302	6	58	898 75	1,584	252	1,836	6	83	30
1,815 16	366	–	38	–	120	100	220	4	71	31
1,137 44	238	70	14	30 00	38	–	38	6	154	32
–	246	–	29	–	458	240	698	4	92	33
1,169 35	101	48	15	30 00	800	697	1,497	4	30	34
978 00	178	–	26	50 00	340	70	410	6	102	35
$20,389 92	8,142	1,243	677	$2,269 15	16,160	6,485	24,045	135	3,214	

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[4] Not reported.

[5] Paid out for "Better Babies' Health Contest"; gold, silver and bronze medals contributed.

ANALYSIS OF PREMIUMS OFFERED, AWARDED AND

	SOCIETIES.	Total Amount offered in Premiums.	Total Amount awarded in Premiums.	Total Amount paid in Premiums.
1	Amesbury and Salisbury (Agricultural and Horticultural),	$320 00	$126 75	$126 75
2	Barnstable County,	373 25	148 50	148 50
3	Blackstone Valley,	139 20	74 35	74 35
4	Deerfield Valley,	181 50	124 85	124 85
5	Eastern Hampden,	351 15	196 50	196 50
6	Essex,	512 75	176 95	176 95
7	Franklin County,	304 50	203 75	203 75
8	Hampshire,	423 60	210 25	210 25
9	Hampshire, Franklin and Hampden,	358 00	225 00	225 00
10	Highland,	234 30	145 70	145 70
11	Hillside,	235 00	172 05	172 05
12	Hingham (Agricultural and Horticultural),	191 75	57 50	57 50
13	Hoosac Valley,	325 25	181 50	181 50
14	Housatonic,	313 50	216 75	216 75
15	Lenox Horticultural,	177 75	106 25	106 25
16	Marshfield (Agricultural and Horticultural),	244 00	163 15	161 90
17	Martha's Vineyard,	274 50	64 20	64 20
18	Massachusetts Horticultural,	249 00	265 25	265 25
19	Massachusetts Society for Promoting Agriculture,[1]	–	–	–
20	Middlesex North,	239 00	197 25	197 25
21	Middlesex South,	321 95	200 00	200 00
22	Nantucket,	215 75	35 50	35 50
23	Oxford,	186 10	105 60	105 60
24	Plymouth County,	117 00	66 50	66 50
25	Quannapowitt,	200 00	112 20	112 20
26	Spencer (Farmers' and Mechanics' Association),	194 75	81 25	81 25
27	Union (Agricultural and Horticultural),	338 15	95 00	95 00
28	West Taunton,	21 25	13 50	13 50
29	Weymouth (Agricultural and Industrial),	263 90	210 80	210 80
30	Worcester,	234 00	175 25	175 25
31	Worcester East,	455 75	252 75	252 75
32	Worcester North (Agricultural and Driving Association),	183 95	98 35	98 35
33	Worcester Northwest (Agricultural and Mechanical Association),	292 00	207 25	206 25
34	Worcester South,	151 00	76 85	76 10
35	Worcester County West,	231 05	139 90	139 90
		$8,854 60	$4,927 20	$4,924 20

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[1] Represented on the Board by special enactment, and makes no returns.

PAID TO CHILDREN AND YOUTHS IN THE YEAR ENDING DEC. 31, 1913.

Amount offered under Head of Farms, etc.	Amount awarded under Head of Farms, etc.	Amount paid under Head of Farms, etc.	Amount offered under Head of Farm and Pet Stock.	Amount awarded under Head of Farm and Pet Stock.	Amount paid under Head of Farm and Pet Stock.	Amount offered under Head of Field and Garden Crops.	Amount awarded under Head of Field and Garden Crops.	Amount paid under Head of Field and Garden Crops.	
–	–	–	$87 75	$47 75	$47 75	$69 00	–	–	1
$24 00	–	–	99 00	29 50	29 50	40 00	$30 00	$30 00	2
9 00	$8 00	$8 00	–	–	–	–	–	–	3
–	–	–	30 25	25 75	25 75	–	–	–	4
–	–	–	143 50	55 00	55 00	–	–	–	5
74 00	18 00	18 00	85 00	21 25	21 25	32 00	–	–	6
–	–	–	87 50	74 25	74 25	–	–	–	7
141 00	60 00	60 00	99 50	78 00	78 00	32 00	–	–	8
–	–	–	133 50	63 00	63 00	–	–	–	9
–	–	–	47 00	39 75	39 75	–	–	–	10
15 00	13 00	13 00	95 00	86 50	86 50	–	–	–	11
19 00	14 00	14 00	–	–	–	36 00	–	–	12
52 00	52 00	52 00	17 00	10 25	10 25	–	–	–	13
40 00	34 00	34 00	99 50	73 50	73 50	42 00	12 00	12 00	14
90 00	72 00	72 00	–	–	–	–	–	–	15
–	–	–	25 00	19 10	19 10	–	–	–	16
30 00	–	–	32 50	14 25	14 25	42 00	10 00	10 00	17
–	–	–	–	–	–	–	–	–	18
–	–	–	–	–	–	–	–	–	19
–	–	–	48 50	46 50	46 50	–	–	–	20
–	–	–	55 50	45 00	45 00	53 50	37 50	37 50	21
30 00	–	–	62 25	21 25	21 25	–	–	–	22
12 00	12 00	12 00	75 75	44 00	44 00	–	–	–	23
6 00	3 00	3 00	15 00	17 75	17 75	6 00	3 00	3 00	24
–	–	–	[2] –	8 00	8 00	–	–	–	25
24 00	6 00	6 00	48 50	8 25	8 25	–	–	–	26
–	–	–	83 50	21 00	21 00	–	–	–	27
–	–	–	–	–	–	5 00	–	–	28
–	–	–	80 00	65 25	65 25	–	–	–	29
–	–	–	136 00	123 00	123 00	–	–	–	30
24 00	13 00	13 00	80 50	51 00	51 00	–	–	–	31
–	–	–	12 00	–	–	–	–	–	32
42 00	35 00	35 00	70 00	57 75	57 50	–	–	–	33
12 00	10 00	10 00	51 25	30 00	30 00	–	–	–	34
12 00	6 00	6 00	59 00	37 50	37 50	–	–	–	35
$656 00	$356 00	$356 00	$1,959 75	$1,214 10	$1,213 85	$357 50	$92 50	$92 50	

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[2] Not reported.

ANALYSIS OF PREMIUMS OFFERED, AWARDED AND PAID TO CHILDREN

	SOCIETIES.	Amount offered under Head of Farm and Garden Products.	Amount awarded under Head of Farm and Garden Products.	Amount paid under Head of Farm and Garden Products.
1	Amesbury and Salisbury (Agricultural and Horticultural),	$81 25	$38 00	$38 00
2	Barnstable County,	102 75	36 75	36 75
3	Blackstone Valley,	53 00	34 25	34 25
4	Deerfield Valley,	48 75	34 10	34 10
5	Eastern Hampden,	114 75	96 20	96 20
6	Essex,	108 25	55 95	55 95
7	Franklin County,	83 75	62 25	62 25
8	Hampshire,	102 10	54 50	54 50
9	Hampshire, Franklin and Hampden,	118 25	99 00	99 00
10	Highland,	65 25	37 35	37 35
11	Hillside,	35 00	27 15	27 15
12	Hingham (Agricultural and Horticultural),	38 00	27 00	27 00
13	Hoosac Valley,	118 25	80 75	80 75
14	Housatonic,	54 50	42 25	42 25
15	Lenox Horticultural,	51 50	26 25	26 25
16	Marshfield (Agricultural and Horticultural),	129 50	82 90	81 65
17	Martha's Vineyard,	75 50	33 20	33 20
18	Massachusetts Horticultural,	249 00	265 25	265 25
19	Massachusetts Society for Promoting Agriculture,[1]	–	–	–
20	Middlesex North,	133 25	110 75	110 75
21	Middlesex South,	111 75	49 00	49 00
22	Nantucket,	63 75	7 00	7 00
23	Oxford,	45 75	22 50	22 50
24	Plymouth County,	40 00	12 00	12 00
25	Quannapowitt,	[2] –	78 20	78 20
26	Spencer (Farmers' and Mechanics' Association),	64 00	42 50	42 50
27	Union (Agricultural and Horticultural),	142 75	41 65	41 65
28	West Taunton,	12 50	10 25	10 25
29	Weymouth (Agricultural and Industrial),	85 00	72 45	72 45
30	Worcester,	91 00	45 25	45 25
31	Worcester East,	124 75	104 50	104 50
32	Worcester North (Agricultural and Driving Association),	90 90	60 95	60 95
33	Worcester Northwest (Agricultural and Mechanical Association),	71 00	29 75	29 50
34	Worcester South,	45 25	30 00	29 85
35	Worcester County West,	109 75	65 40	65 40
		$2,860 75	$1,915 25	$1,913 60

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[1] Represented on the Board by special enactment, and makes no returns.

AND YOUTHS IN THE YEAR ENDING DEC. 31, 1913 — *Concluded.*

Amount offered under Head of Dairy Products.	Amount awarded under Head of Dairy Products.	Amount paid under Head of Dairy Products.	Amount offered under Head of Domestic Manufactures.	Amount awarded under Head of Domestic Manufactures.	Amount paid under Head of Domestic Manufactures.	Amount offered for All Other Objects, strictly Agricultural.	Amount awarded for All Other Objects, strictly Agricultural.	Amount paid for All Other Objects, strictly Agricultural.	
–	–	–	$73 00	$41 00	$41 00	$9 00	–	–	1
–	–	–	107 50	52 25	52 25	–	–	–	2
–	–	–	77 20	32 10	32 10	–	–	–	3
–	–	–	10 50	8 25	8 25	92 00	$56 75	$56 75	4
–	–	–	68 90	33 30	33 30	24 00	12 00	12 00	5
–	–	–	213 50	81 75	81 75	–	–	–	6
–	–	–	133 25	67 25	67 25	–	–	–	7
–	–	–	49 00	17 75	17 75	–	–	–	8
–	–	–	106 25	63 00	63 00	–	–	–	9
$5 00	$3 50	$3 50	100 05	48 85	48 85	17 00	16 25	16 25	10
1 00	90	90	53 00	44 50	44 50	–	–	–	11
–	–	–	18 75	16 50	16 50	80 00	–	–	12
–	–	–	138 00	38 50	38 50	–	–	–	13
–	–	–	77 50	55 00	55 00	–	–	–	14
–	–	–	36 25	8 00	8 00	–	–	–	15
–	–	–	89 50	61 15	61 15	–	–	–	16
–	–	–	94 50	6 75	6 75	–	–	–	17
–	–	–	–	–	–	–	–	–	18
–	–	–	–	–	–	–	–	–	19
–	–	–	24 00	19 50	19 50	15 00	20 50	20 50	20
–	–	–	101 20	68 50	68 50	–	–	–	21
–	–	–	59 75	7 25	7 25	–	–	–	22
–	–	–	39 10	13 60	13 60	13 50	13 50	13 50	23
–	–	–	50 00	30 75	30 75	–	–	–	24
–	–	–	[2] –	26 00	26 00	–	–	–	25
–	–	–	58 25	24 50	24 50	–	–	–	26
13 25	3 50	3 50	98 65	28 85	28 85	–	–	–	27
–	–	–	3 75	3 25	3 25	–	–	–	28
–	–	–	98 90	73 10	73 10	–	–	–	29
–	–	–	7 00	7 00	7 00	–	–	–	30
–	–	–	226 50	84 25	84 25	–	–	–	31
–	–	–	81 05	37 40	37 40	–	–	–	32
–	–	–	76 00	34 75	34 25	75 00	50 00	50 00	33
–	–	–	42 50	6 25	6 25	–	–	–	34
–	–	–	50 30	31 00	31 00	–	–	–	35
$19 25	$7 90	$7 90	$2,463 60	$1,171 85	$1,171 35	$325 50	$169 00	$169 00	

[2] Not reported.

DIRECTORY

OF THE

AGRICULTURAL AND SIMILAR ORGANIZATIONS OF MASSACHUSETTS.

1914.

STATE BOARD OF AGRICULTURE, 1914.

Members ex Officio.

HIS EXCELLENCY DAVID I. WALSH.
HIS HONOR EDWARD P. BARRY.
HON. FRANK J. DONAHUE, *Secretary of the Commonwealth.*
KENYON L. BUTTERFIELD, *President Massachusetts Agricultural College.*
FRED F. WALKER, *Commissioner of Animal Industry.*
F. WILLIAM RANE, B. Agr., M.S., *State Forester.*
WILFRID WHEELER, *Secretary of the Board.*

Members appointed by the Governor and Council.

	Term expires
FRANK P. NEWKIRK of Easthampton,	1914
HENRY M. HOWARD of Newton (P. O. West Newton),	1915
CHARLES M. GARDNER of Westfield,	1916

Members chosen by the Incorporated Societies.

Amesbury and Salisbury (Agricultural and Horticultural),	A. WILLIS BARTLETT of Salisbury,	1915
Barnstable County,	JOHN BURSLEY of Barnstable (P. O. West Barnstable),	1916
Blackstone Valley,	JACOB A. WILLIAMS of Northbridge,	1915
Deerfield Valley,	DAVID T. BARNARD of Shelburne,	1917
Eastern Hampden,	O. E. BRADWAY of Monson,	1915
Essex,	FREDERICK A. RUSSELL of Methuen,	1917
Franklin County,	GEORGE E. TAYLOR, JR., of Shelburne,	1916
Hampshire,	F. E. FARRAR of Amherst,	1916
Hampshire, Franklin and Hampden,	RUFUS M. SMITH of Hadley,	1915
Highland,	JOHN T. BRYAN of Middlefield (P. O. Chester, R. F. D.),	1917
Hillside,	HAROLD S. PACKARD of Plainfield,	1917
Hingham (Agricultural and Horticultural),	U. S. BATES of Hingham,	1915
Hoosac Valley,	ABNER TOWNE of Williamstown,	1915
Housatonic,	R. H. RACE of Egremont,	1915
Lenox Horticultural,	ALFRED H. WINGETT of Lenox,	1917
Marshfield (Agricultural and Hort'l),	WALTER H. FAUNCE of Kingston,	1915
Martha's Vineyard,	JAMES F. ADAMS of West Tisbury,	1916
Massachusetts Horticultural,	EDWARD B. WILDER of Boston (P. O. Dorchester),	1915
Massachusetts Society for Promoting Agriculture,	N. I. BOWDITCH of Framingham,	1915
Middlesex North,	GEORGE W. TRULL of Tewksbury (P. O. Lowell, R. F. D.),	1917
Middlesex South,	JOHN J. ERWIN of Wayland,	1917
Nantucket,	HERBERT G. WORTH of Nantucket,	1915
Oxford,	WALTER A. LOVETT of Oxford,	1916
Plymouth County,	ERNEST LEACH of Bridgewater,	1917
Quannapowitt,	CALVERT H. PLAYDON, D.V.S., of Reading,	1916
Spencer (Farmers' and Mechs.' Ass'n),	EDWARD WARREN of Leiecster,	1916
Union (Agricultural and Hort'l),	HENRY K. HERRICK of Blandford,	1916
West Taunton,	CHARLES I. KING of Taunton,	1917
Weymouth (Agricultural and Ind'l),	THERON L. TIRRELL of Weymouth (P. O. South Weymouth),	1915
Worcester,	EDWARD A. WATERS of West Boylston,	1917
Worcester East,	GEORGE F. MORSE of Lancaster (P. O, South Lancaster),	1915
Worcester North (Agricultural and Driving Association),	L. E. FLETCHER of Fitchburg,	1915
Worcester Northwest (Agricultural and Mechanical),	ALBERT ELLSWORTH of Athol,	1916
Worcester South,	WILLIAM E. PATRICK of Warren,	1916
Worcester County West,	JAMES A. RICE of Barre	1917

ORGANIZATION OF THE BOARD.

OFFICERS.

President,	HIS EXCELLENCY DAVID I. WALSH, *ex officio.*
First Vice-President,	JOHN BURSLEY of Barnstable.
Second Vice-President,	FREDERICK A. RUSSELL of Methuen.
Secretary,	WILFRID WHEELER of Concord.

Office, Room 136, State House, Boston.

COMMITTEES.

Executive Committee.

Messrs. JOHN BURSLEY of Barnstable.
O. E. BRADWAY of Monson.
GEORGE F. MORSE of Lancaster.
WILLIAM E. PATRICK of Warren.
CHARLES M. GARDNER of Westfield.
FREDERICK A. RUSSELL of Methuen.
HENRY M. HOWARD of Newton.
WALTER A. LOVETT of Oxford.
GEORGE E. TAYLOR, Jr., of Shelburne.

Committee on Agricultural Societies.

Messrs. O. E. BRADWAY of Monson.
ALBERT ELLSWORTH of Athol.
THERON L. TIRRELL of Weymouth.
JACOB A. WILLIAMS of Northbridge.
HERBERT G. WORTH of Nantucket.

Committee on Domestic Animals, Poultry and Dairy Products.

Messrs. WILLIAM E. PATRICK of Warren.
HERBERT G. WORTH of Nantucket.
ABNER TOWNE of Williamstown.
RUFUS M. SMITH of Hadley.
HENRY K. HERRICK of Blandford.

Committee on the Massachusetts Agricultural College and the Massachusetts Agricultural Experiment Station.

Messrs. JOHN BURSLEY of West Barnstable.
FRANK P. NEWKIRK of Easthampton.
WILLIAM E. PATRICK of Warren.
JOHN J. ERWIN of Wayland.
R. HENRY RACE of Egremont.

Committee on Orcharding and Fruit Growing.

Messrs. FREDERICK A. RUSSELL of Methuen.
ALFRED H. WINGETT of Lenox.
R. H. RACE of Egremont.
EDWARD WARREN of Leicester.
EDWARD B. WILDER of Dorchester.

Committee on Grasses and Forage Crops.

Messrs. GEORGE E. TAYLOR, Jr., of Shelburne.
U. S. BATES of Hingham.
N. I. BOWDITCH of Framingham.
CALVERT H. PLAYDON of Reading.
HAROLD S. PACKARD of Plainfield.

Committee on Markets and Transportation.

Messrs. CHARLES M. GARDNER of Westfield.
F. E. FARRAR of Amherst.
L. E. FLETCHER of Fitchburg.
A. WILLIS BARTLETT of Salisbury.
C. I. KING of Taunton.
DAVID T. BARNARD of Shelburne.

Committee on Farm Tools and Machinery.

Messrs. WALTER A. LOVETT of Oxford.
JACOB A. WILLIAMS of Northbridge.
JAMES A. RICE of Barre.
ERNEST LEACH of Bridgewater.
EDWARD A. WATERS of West Boylston.

Committee on Institutes and Public Meetings.

Messrs. George F. Morse of Lancaster.
James F. Adams of West Tisbury.
Kenyon L. Butterfield of Amherst.
George W. Trull of Tewksbury.
George E. Taylor, Jr., of Shelburne.

Committee on Irrigation and Drainage.

Messrs. Henry M. Howard of Newton.
John T. Bryan of Middlefield.
John J. Erwin of Wayland.
F. E. Farrar of Amherst.
Walter H. Faunce of Kingston.

The Secretary is a member, *ex officio*, of the above committees.

DAIRY BUREAU.

Messrs. Charles M. Gardner of Westfield, 1914; O. E. Bradway of Monson, 1915; George W. Trull of Tewksbury, 1916.

Executive Officer,	Wilfrid Wheeler of Concord
General Agent,	P. M. Harwood of Barre.

Office, Room 136, State House.

STATE NURSERY INSPECTOR.

Henry T. Fernald, Ph.D., of Amherst.

STATE ORNITHOLOGIST.

Edward Howe Forbush of Westborough.

STATE INSPECTOR OF APIARIES.

Burton N. Gates, Ph.D., of Amherst.

SPECIALISTS.

Chemist,	Dr. J. B. Lindsey,	Amherst.
Entomologist,	Prof. C. H. Fernald,	Amherst.
Botanist,	Dr. George E. Stone,	Amherst.
Pomologist,	Prof. F. C. Sears,	Amherst.
Veterinarian,	Prof. James B. Paige,	Amherst.
Engineer,	William Wheeler,	Concord.
Agricultural Club Work,	Prof. William R. Hart,	Amherst.

MASSACHUSETTS AGRICULTURAL COLLEGE.

Location, Amherst, Hampshire County.

The Corporation.

Members of the Corporation.

	Term expires
Charles E. Ward of Buckland,	1914
Elmer D. Howe of Marlborough,	1914
Nathaniel I. Bowditch of Framingham,	1915
William Wheeler of Concord,	1915
Arthur G. Pollard of Lowell,	1916
Charles A. Gleason of New Braintree,	1916
Frank Gerrett of Greenfield,	1917
Harold L. Frost of Arlington,	1917
Charles H. Preston of Danvers,	1918
Frank A. Hosmer of Amherst,	1918
Davis R. Dewey of Cambridge,	1919
George P. O'Donnell of Northampton,	1919
William H. Bowker of Concord,	1920
George H. Ellis of West Newton,	1920

Members ex Officio.

His Excellency Governor David I. Walsh.

President of the Corporation.

Kenyon L. Butterfield, LL.D.,	*President of the College.*
David Snedden,	*Commissioner of Education.*
Wilfrid Wheeler,	*Secretary of the State Board of Agriculture.*

Officers of the Corporation.

His Excellency Governor David I. Walsh of Boston,	*President.*
Charles A. Gleason of New Braintree,	*Vice-President.*
Wilfrid Wheeler of Concord,	*Secretary.*
Fred C. Kenney of Amherst,	*Treasurer.*
Charles A. Gleason of New Braintree,	*Auditor.*

Examining Committee of Overseers from the State Board of Agriculture.

Messrs. Bursley, Newkirk, Patrick, Erwin and Race.

Massachusetts Agricultural Experiment Station.

William P. Brooks, Ph.D.,	*Director.*
Joseph B. Lindsey, Ph.D.,	*Vice-Director.*
Frank A. Waugh, M.Sc.,	*Horticulturist.*
George E. Stone, Ph.D.,	*Botanist and Vegetable Pathologist.*
Henry T. Fernald, Ph.D.,	*Entomologist.*
James B. Paige, B.Sc., D.V.S.,	*Veterinarian.*
John E. Ostrander, A.M., C.E.,	*Meteorologist.*

Agricultural Societies incorporated by Special Act of the Legislature, and represented on the Board of Agriculture.

NAME.	PRESIDENT.	SECRETARY.	TREASURER.
Amesbury and Salisbury,[1]	A. Willis Bartlett, Salisbury,	M. H. Sands, Amesbury.	John J. Mason, Amesbury.
Barnstable County,	Thomas C. Thatcher, Yarmouth.	Marcus N. Harris, Barnstable.	Henry C. Davis, Barnstable (P. O. Cummaquid).
Blackstone Valley,	W. A. L. Bazeley, Uxbridge.	Dr. M. R. Sharpe, Uxbridge.	C. A. Barton, Uxbridge.
Deerfield Valley,	Frank M. Legate, Charlemont.	Stephen W. Hawkes, Charlemont.	Charles T. Haskins, Charlemont.
Eastern Hampden,	O. E. Bradway, Monson.	George E. Clough, Palmer.	Fred E. Cady, Monson.
Essex,	Charles H. Preston, Danvers (P. O. Hathorne).	Fred A. Smith, Danvers.	William S. Nichols, Salem.
Franklin County,	Frank Gerrett, Greenfield.	J. H. Murphy, Greenfield.	F. H. Snow, Greenfield.
Hampshire,	Francis E. Farrar, Amherst.	James W. T. Davis, Amherst.	James W. T. Davis, Amherst.
Hampshire, Franklin and Hampden,	Clarence E. Hodgkins, Northampton.	Chas. A. Montgomery, Northampton.	A. J. Morse, Northampton.
Highland,	H. A. Ford, Dalton.	John T. Bryan, Middlefield (P. O. Chester, R. F. D.).	W. A. Olds, Middlefield.
Hillside,	Charles A. Bisbee, Chesterfield.	Clement F. Burr, Worthington.	Howard E. Drake, Cummington.
Hingham,[1]	Alfred L. Lincoln, Hingham.	William L. Howard, Hingham.	Harry F. Zahn, Hingham.
Hoosac Valley,	Dr. F. D. Stafford, North Adams.	George F. Miller, North Adams.	C. J. Arnold, North Adams.
Housatonic,	Zaccheus H. Cande, Sheffield.	Joseph H. Maloney, Great Barrington.	George L. Taylor, Great Barrington.
Lenox Horticultural,	A. McConnachie, Lenox.	G. H. Instone, Lenox.	A. J. Loveless, Lenox.
Marshfield,[1]	Thomas W. Lawson, Boston.	Israel H. Hatch, Marshfield.	M. Herman Kent, Marshfield.
Martha's Vineyard,	Davis D. Look, West Tisbury.	F. Allen Look, West Tisbury.	George Hunt Luce, West Tisbury.
Massachusetts Horticultural,	J. K. M. L. Farquhar, Boston.	William P. Rich, 300 Massachusetts Ave., Boston.	Walter Hunnewell, 87 Milk St., Boston.
Massachusetts Society for Promoting Agriculture.	Prof. Charles S. Sargent, Brookline.	Gen. Francis Henry Appleton, Peabody, and 251 Marlborough St., Boston.	R. M. Saltonstall, Newton.

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[1] And horticultural.

AGRICULTURAL SOCIETIES, ETC. — *Concluded.*

NAME.	PRESIDENT.	SECRETARY.	TREASURER.
Middlesex North,	George W. Trull, Tewksbury.	George B. Coburn, Lowell.	John A. Weinbeck, Lowell.
Middlesex South,	John P. Bowditch, Framingham.	Peter N. Everett, Framingham.	George E. Fay, Framingham.
Nantucket,	Joseph A. Johnson, Nantucket.	Josiah F. Murphy, Nantucket.	Benjamin F. Worth, Nantucket.
Oxford,	Walter E. Schuster, Douglas.	James E. Darling, Oxford.	George E. Chaffee, Oxford.
Plymouth County,	Ernest Leach, Bridgewater.	Howard B. Wilbur, West Bridgewater, and Barristers' Hall, Brockton.	Howard B. Wilbur, West Bridgewater, and Barristers' Hall, Brockton.
Quannapowitt,	Arthur H. Jewett, Reading.	Arthur W. Coolidge, Reading.	Henry A. Upton, North Reading.
Spencer Farmers' and Mechanics' Association,	Henry R. Prescott, Spencer.	George H. Ramer, Spencer.	George H. Ramer, Spencer.
Union,[1]	H. A. Moses, Russell.	Enos W. Boise, Blandford.	George O. Williams, Blandford.
West Taunton,	Mason E. Marvel, Taunton.	George A. Lincoln, Taunton.	Charles I. King, Taunton.
Weymouth (Agricultural and Industrial),	Ralph P. Burrell, Weymouth (P. O. South Weymouth).	Thomas V. Nash, Weymouth (P. O. South Weymouth).	D. Frank Daly, Weymouth (P. O. South Weymouth).
Worcester,	W. D. Ross, Worcester.	B. Durell, Worcester.	L. F. Herrick, Worcester.
Worcester East,	Bayard Thayer, Lancaster.	Warren Goodale, Clinton.	John W. Forrester, Clinton.
Worcester North (Agricultural and Driving Association).	L. L. Richardson, Leominster.	Charles H. Morse, Fitchburg.	R. H. Bingham, Fitchburg.
Worcester Northwest (Agricultural and Mechanical).	Clifford H. Smith, Athol.	Albert Ellsworth, Athol.	Clarence E. Deane, Athol.
Worcester South,	Herman T. Hyde, Southbridge.	George H. Clemence, Southbridge.	Ernest G. Barnes, Sturbridge.
Worcester County West,	William A. Gaston, Shawmut Bank Building, Boston, and Barre.	D. H. Rice, Barre.	John S. Rice, Barre.

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[1] And horticultural.

HORTICULTURAL SOCIETIES.

NAME.	LOCATION.	PRESIDENT.	SECRETARY.
Hampden County,	Springfield,	Robert O. Morris, Springfield.	Marshall Headle, Springfield.
Houghton,	Lynn,	Frank E. Whipple, 26 Garland St., Lynn.	Mrs. Nettie L. Day, 20 Webster St., Lynn.
Massachusetts,	The State,	John K. L. M. Farquhar, 6 South Market St., Boston.	William P. Rich, 300 Massachusetts Ave., Boston.
Medford,	Medford,	Charles M. Hayden, Water St., Medford.	Miss Kate M. Budd, Bradlee Rd., Medford.
Melrose Horticultural and Improvement,	Melrose,	Bernard B. Dunbar, 47 Malverne St., Melrose.	Mrs. B. B. Dunbar, 47 Malverne St., Melrose.
New Bedford,	New Bedford,	David F. Roy, Marion.	Jeremiah M. Taber, 888 Rockdale Ave., New Bedford.
North Shore,	Manchester,	J. L. Chapman, Beverly.	Albert F. Simms, 29 Highland Ave., Manchester.
Worcester County,	Worcester,	Edward W. Breed, 94 Prescott St., Clinton.	Leonard C. Midgley, Lyman St., Westborough.

FARMERS' AND MECHANICS' CLUBS AND ASSOCIATIONS.

NAME.	LOCATION.	PRESIDENT.	SECRETARY.
Belchertown,	Belchertown,	Dwight F. Shumway, Belchertown.	Harry W. Conkey, Belchertown.
Bolton,	Bolton,	Gilbert H. Wheeler, Bolton.	Harry W. Butts, Bolton.
Holden,	Holden,	Franklin C. Hubbard, Holden.	George M. Perry, Holden.
Needham,	Needham,	Richmond Favour, Natick.	Mrs. Alice M. Frost, 200 Fuller St., West Newton.
Pepperell,	Pepperell,	William E. Chapman, Pepperell.	Leroy A. Shattuck, Pepperell.
Shrewsbury,	Shrewsbury,	E. A. Bartlett, Shrewsbury.	Fred J. Stone, Shrewsbury.
Westminster,	Westminster,	G. A. Sargent, Westminster.	E. C. Mansur, Westminster.

FARMERS' CLUBS.

NAME.	LOCATION.	PRESIDENT.	SECRETARY.
Boxborough,	Boxborough,	Richard Y. Nelson, Acton.	George W. Burroughs, Acton (P. O. West Acton).
Buckland,	Buckland,	F. L. Warfield, Buckland.	Miss Lura E. Hite, Shelburne Falls.
Concord,	Concord,	C. W. Prescott, Concord.	George M. Baker, Concord.
East Charlemont,	Charlemont,	Warren W. Smith, Charlemont (P. O. East Charlemont).	Horace Wells French, Charlemont (P. O. East Charlemont).
Easthampton,	Easthampton,	D. A. Forbes, West St., Easthampton.	R. H. Clapp, Clapp St., Easthampton.
Franklin,	Franklin,	R. A. Messerle, Franklin.	L. W. Daniels, Franklin.
Halifax,	Halifax,	James T. Thomas, Halifax.	Mrs. Carrie A. Hayward, Halifax.
Medway,	Medway,	Charles A. Wilson, Medway, R. F. D.	Linton Sevrens, West Medway.
New Braintree,	New Braintree,	Edwin L. Havens, New Braintree.	Walter L. McClanathan, Barre (P. O. Barre Plains).
Oakham,	Oakham,	Jesse Allen, Oakham.	Mrs. Caroline D. Fairbank, Oakham.
South Bristol,	New Bedford,	Elmer M. Poole, North Dartmouth.	Allen Russell, Acushnet.
Tatnuck,	Worcester,	Charles T. Foster, 3 Hadwen Rd., Worcester.	H. Ward Moore, 28 Amherst St., Worcester.
Upton,	Upton,	George R. Pierce, Upton.	Edward B. Newton, Upton.
West Brookfield,	West Brookfield,	William E. Patrick, Warren.	Sumner H. Read, Brookfield.

POULTRY ASSOCIATIONS.

NAME.	LOCATION.	PRESIDENT.	SECRETARY.
Attleboro Poultry Association,	Attleboro,	William H. Saart, Attleborough.	Henry E. Sibley, Attleborough.
Boston Poultry Association,	Boston,	John Lowell, Boston.	W. B. Atherton, 36 Bromfield St., Boston.
Dalton Poultry, Pigeon and Pet Stock Association.	Dalton,	George C. Maynard, Dalton.	Lawrence A. Haworth, Dalton.
Eastern Massachusetts Poultry and Pigeon Association.	Everett,	Henry C. Green, 202 Vine St., Everett.	B. P. Nicholls, 7 Carey Ave., Chelsea.
Essex County Poultry Association,	Essex County,	J. D. Barnes, Wenham.	Arthur Elliot, Peabody.

Holyoke Poultry and Pet Stock Association, Inc,	Holyoke,	George H. Cadwell, Amherst.	George Barnett, 473 South St., Holyoke.
Lawrence Poultry and Pet Stock Association,	Lawrence,	Joseph F. Adams, 62 Woodland St., Lawrence.	Irving W. Dillon, Stevens St., Lawrence.
Lenox Poultry Association,	Lenox,	William J. Welsh, Lenox.	George A. Mole, Lenox.
Mansfield Poultry, Pigeon and Pet Stock Association, Inc.	Mansfield,	Clarence H. Budlong, Park St., Mansfield.	Miss L. Faye Home, 56 Draper Ave., Mansfield.
Massachusetts State Poultry Association,	The State,	George F. Eastman, Granby.	W. H. McClary, Hanover (P. O. South Hanover).
Milford Poultry Association,	Milford,	James Nolan, Milford.	William H. Pyne, Milford.
New England Poultry Association,	Greenfield,	J. E. Weatherwax, Maple St., Greenfield.	S. H. Stone, 4 Walnut St., Greenfield.
Northern Berkshire Poultry Association, Inc.,	North Adams,	W. G. Carter, 28 North St., North Adams.	Albert Whitney, 29 Nelson St., North Adams.
Southern Massachusetts Poultry and Pet Stock Association.	New Bedford,	Bancroft Winsor, Acushnet,	Dr. S. D. Berry, New Bedford.
Springfield Poultry Club, Inc.,	Springfield,	Harry C. Lapham, 500 Main St., Springfield.	W. C. Roraback, 291 Longmeadow St., Springfield.
Worcester Poultry Association, Inc.,	Worcester,	Walter D. Ross, 90 Front St., Worcester.	William H. Fitton, 42 Richmond Ave., Worcester.

BEEKEEPERS' SOCIETIES AND ASSOCIATIONS.

Berkshire County Beekeepers' Association,	Berkshire County,	C. M. Musgrove, West St., Pittsfield.	John Buckler, Blythewood Farms, Pittsfield.
Eastern Massachusetts Society of Beekeepers,	Eastern Massachusetts,	S. J. Hawkins, 4 Emery St., Everett.	Mrs. Leslie A. M. Stewart, 200 Union St., Franklin.
German Society for the Cultivation of Honey Bees.	Essex County,	August Seifert, Methuen.	Hugo E. Dick, Lawrence.
Lawrence and Suburban Bee Club,	Lawrence,	John Ullev, Colby St., Lawrence.	Paul Loeffler, 59 Baremeadow St., Methuen.
Hampshire, Hampden and Franklin Beekeepers' Association.	Connecticut Valley,	Wilbur M. Purrington, Haydenville.	Burton N. Gates, Amherst.
State Beekeepers' Association of Massachusetts,	The State,	John L. Byard, Amherst.	Burton N. Gates, Amherst.
Worcester County Beekeepers' Association,	Worcester,	O. F. Fuller, Blackstone, R. F. D.	J. Sidney Whittemore, Leicester.

MISCELLANEOUS.

NAME.	LOCATION.	PRESIDENT.	SECRETARY.
Boston Market Gardeners' Association,	Boston,	M. Ernest Moore, Arlington.	James P. Esty, Newton Center.
Brockton Agricultural Society,	Brockton,	Charles Howard, 206 West Elm St., Brockton.	Perley G. Flint, 175 Newbury St., Brockton.
Cape Cod Cranberry Growers' Association,	Wareham,	John C. Makepeace, Wareham.	Lemuel C. Hall, Wareham.
Connecticut Valley Breeders' Association,	Amherst,	A. C. Warner, Sunderland.	J. A. McLean, Amherst.
Franklin Harvest Club,	Franklin County,	Lyman Crafts, Whately.	W. M. Purrington, Williamsburg (P. O, Haydenville.)
Gardeners' and Florists' Club of Boston,	Boston,	William J. Kennedy, Chestnut Hill.	William Nicol Craig, Brookline.
Hampden County Improvement League,	Springfield,	Horace A. Moses, Mittineague.	John A. Scheurle, Springfield.
Hampden Harvest Club,	Connecticut Valley,	– –	Edwin C. Powell, Springfield.
Massachusetts Cattle Owners' Association,	The State,	Charles W. Wood, Worcester.	James L. Harrington, Lunenburg.
Massachusetts Creamerymen's Association,	The State,	W. A. Harlow, Cummington.	W. P. B. Lockwood, Amherst.
Massachusetts Dairymen's Association,	The State,	John P. Bowditch, Framingham.	W. P. B. Lockwood, Amherst.
Massachusetts Federation for Rural Progress,	The State,	Kenyon L. Butterfield, Amherst.	E. L. Morgan, Amherst.
Massachusetts Forestry Association,	Boston,	Nathaniel T. Kidder, 69 Ames Building, Boston, or Milton.	Harris A. Reynolds, 4 Joy St., Boston.
Massachusetts Fruit Growers' Association,	The State,	Fred C. Sears, Amherst.	F. Howard Brown, Farmcroft Rd., Marlborough.
Massachusetts Nurserymen's Association,	The State,	Charles R. Fish, Worcester.	Winthrop H. Thurlow, West Newbury.
New England Corn Exposition, Inc.,	New England,	George E. Taylor, Jr., Shelburne.	F. L. Weare, Seabrook, New Hampshire.
New England Federation of Agricultural Students.	New England,	W. C. Kennedy, Amherst.	M. R. Young, Storrs, Connecticut.
New England Federation for Rural Progress,	New England,	R. M. Bowen, 211 Washington St., Providence, Rhode Island.	J. E. McKibben, Chamber of Commerce Building, Boston.
New England Fruit Show,	New England,	J. Lewis Ellsworth, Worcester.	F. Howard Brown, Marlborough.
New England Nurserymen's Association,	New England,	John R. Barnes, Yalesville.	Charles Adams, Springfield.

Southern New England Country Fair,	Dartmouth,	Elton S. Wilde, New Bedford.	Charles T. Battey, New Bedford.
Stockbridge Club,	Amherst,	P. F. Whitmore, Amherst.	W. C. Kennedy, Amherst.
Ware Agricultural and Driving Association,	Ware,	T. P. Strong, Church St., Ware.	James E. Kennedy, 84 Water St., Ware.
Worcester County Harvest Club,	Worcester County,	Hermon T. Hyde, Southbridge.	Mrs. D. A. Howe, 8 Burncoat St., Worcester.
Worcester County Improvement League and Alfalfa Club.	Worcester County,	J. Lewis Ellsworth, 11 Foster St., Worcester.	William J. Conlon, 11 Foster St., Worcester.

MASSACHUSETTS PATRONS OF HUSBANDRY.

Officers of the State Grange, 1914.

Master,	E. E. Chapman of Ludlow.
Overseer,	Leslie R. Smith of Hadley.
Lecturer,	Mrs. George S. Ladd of Sturbridge.
Steward,	E. H. Gilbert of Stoughton (P. O. address, North Easton).
Assistant Steward,	Henry N. Jenks of Cheshire (P. O. address, Adams, R. F. D).
Chaplain,	Rev. A. H. Wheelock of Marlborough.
Treasurer,	Hon. F. A. Harrington of Worcester.
Secretary,	William N. Howard of Easton (P. O. address, North Easton).
Gate Keeper,	Samuel T. Brightman of Westport (P. O. address, Central Village).
Ceres,	Mrs. Sarah H. Holland of Millis.
Pomona,	Mrs. Evelyn M. Adams of West Tisbury.
Flora,	Mrs. Laura M. Sargent of Amesbury.
Lady Assistant Steward,	Mrs. Margaret A. Sarre, 537 Merrimack St., Lowell.

Executive Committee.

George S. Ladd,	Sturbridge.
Carlton D. Richardson,	West Brookfield.
Warren C. Jewett,	Worcester.

General Deputies.

N. B. Douglas,	Sherborn.
E. D. Howe,	Marlborough.
W. C. Jewett,	Worcester.
G. S. Ladd,	Sturbridge.
C. D. Richardson,	West Brookfield.
C. M. Gardner,	Westfield.

Organizing Deputy.

William T. Herrick,	Westborough.

Pomona Deputies.

Joseph W. Baldwin,	North Easton.
Walter H. Sawyer,	Winchendon.
Hermon W. King,	East Longmeadow.
Elbridge Noyes,	Newbury.

Subordinate Deputies.

George W. Sherman,	Brimfield.
Charles R. Damon,	Williamsburg.
Ward A. Harlow,	Cummington.
Edwin B. Hale,	Bernardston.
John Bursley,	Barnstable (P. O. address, West Barnstable).
Moses U. Gaskill,	Mendon.
Horace E. Wallis,	Waltham.
Charles G. Preston,	Danvers (P. O. address, Hathorne).
Dr. M. H Williams,	Sunderland.
Fred E. Alden,	Easton (P. O address, South Easton).

SUBORDINATE DEPUTIES — *Con.*

Norman L. Peavey,	Dracut.
Dr. A. W. Gorham,	Hanson (P. O. address, North Hanson).
Peter I. Adams,	Stockbridge.
George A. Witherell,	Orange.
Harry D. Towne,	Montague (P. O. address, Miller's Falls).
George L. Averill,	Andover.
Elliott M. Clemence,	Southbridge.
Everett W. Stone,	Auburn.
Harold J. Greenwood,	193 May St., Worcester.
George C. Donaldson,	Hamilton (P. O. address, South Hamilton).
Frank T. Marston,	20 Fairmount St., Melrose.
Raymond J. Gregory,	Princeton.
John J. Glynn,	Dalton.
John H. Noble,	Pittsfield.
Walter H. Brown,	Peabody (P. O. address, West Peabody).
Harold A. Goff,	Rehoboth (P. O. address, Attleborough, R. F. D.).
John R. Comley,	Bedford.
Clifford R. Ripley,	Blandford.
Lester R. Hayward,	North Reading (P. O. address, South Middleton).

SPECIAL DEPUTIES.

William N. Howard,	Easton.
John P. Ranger,	North Brookfield.
Charles A. Wright,	Billerica.
Charles H. Shaylor,	Lee.
Evan F. Richardson,	Millis.

COMMITTEE ON BIRDS.

Raymond J. Gregory, *Chairman*,	Princeton.
George C. Donaldson,	Hamilton.
Clayton E. Stone,	Lunenburg.
Mrs. E. O. Marshall,	New Salem.
Mrs. Ida Farr Miller,	Wakefield.
Mrs. Florence L. Butler,	Charlemont.

TRUSTEES OF EDUCATIONAL FUND.

Evan F. Richardson, *Chairman*,	Millis.
Mrs. George S. Ladd, *Secretary*,	Sturbridge.
James C. Poor, *Treasurer*	North Andover.
John H. Noble,	Pittsfield.
Edward E. Chapman,	Ludlow.

COMMITTEE ON DEGREE STAFFS.

Mrs. Sarah H. Holland,	Millis.
Mrs. Fred J. Reed,	Shrewsbury.

MASSACHUSETTS PATRONS OF HUSBANDRY — *Continued.*

NAME.	MASTER.	LECTURER.	SECRETARY.
Pomona Granges.			
Middlesex and Norfolk, No. 1,	Joel H. Stratton, Sherborn.	Abel F. Stevens, Wellesley.	Mrs. Emma C. Luce, Box 27, Ashland.
Essex County, No. 2,	Fred E. Hall, Haverhill.	Albert P. Wadleigh, Merrimac.	Miss Matilda B. Lund, Ward Hill, R. F. D.
Middlesex Worcester, No. 3,	Millard S. Sawyer, Groton.	Mrs. Alice E. Cummings, Shirley.	Mrs. Minnie L. F. Knight, Townsend Harbor.
Franklin and Worcester, No. 4,	Mr. E. S. Putnam, Wendell Depot.	Mrs. Anna Bacon, Athol.	Mrs. Minnie W. Spaulding, Athol.
Worcester West, No. 5,	John Putnam, Baldwinville.	Mrs. Minnie A. Seaver, Templeton.	Mrs. Rachel S. Titterton, 156 State Ave., Palmer.
Berkshire County, No. 6,	Alfred N. Warren, Hinsdale.	George W. Clarke, Lanesborough.	Mrs. Bessie S. Wellington, 48 Orchard St., Pittsfield.
Worcester Central, No. 7,	H. Ward Moore, 27 Amherst St., Worcester.	Mrs. Howard G. Ramsey, Uxbridge.	Mrs. A. E. Grout, Millbury.
Hampshire County, No. 8,	Raymond A. Warner, Williamsburg.	Mrs. Chas. A. Strong, Amherst.	Mrs. Chas. R. Damon, Williamsburg.
Worcester Southwest, No. 9,	William Casey, Charlton Depot.	Mrs. E. McKinstry, Southbridge.	Mrs. Mabel A. Nichols, East Brookfield.
Worcester and Norfolk, No. 10,	Wesley E. Howes, North Bellingham.	Mrs. A. H. Greenwood, Milford.	Mrs. Annie E. Gaskill, South Milford.
Borough, No. 11,	Willis E. Wheeler, Northborough.	Mrs. S. M. Thompson, Westborough, R. F. D. 2.	Mrs. M. A. Gilmore, Westborough, R. F. D. 2, Box 43.
The Springfield, No. 12,	Francis L. Jones, Palmer.	Mrs. A. F. Ballard, Hampden.	Mrs. Carrie L. Hayward, Agawam.
Old Colony, No. 13,	J. Hubert Cushing, Middleborough.	William N. Howard, North Easton.	Mrs. Alida N. Stevens, 75 Tremont St., South Braintree.
Worcester East, No. 14,	Clarence Beard, Harvard.	Mrs. Amos C. Wheeler, Bolton.	Mrs. Ida A. Cunningham, Lancaster.
Quaboag, No. 15,	John H. Webb, West Brookfield.	Ida L. Warren, Leicester.	Rachel K. Warren, Leicester.
Middlesex North, No. 16,	Alonzo H. Sutherland, Westford.	Mrs. Nettie O Wilson, Carlisle.	Mrs. Lulu M. Hutchins, Billerica.
Deerfield Valley, No. 17,	George E. Clark, Colrain.	Mrs. K. Cram, Colrain.	Mrs. E. S. Bardwell, Bardwell's Ferry.
Western Hampden, No. 18,	M. A. Munson, Huntington.	Mrs. A. A. Sanborn, Westfield.	Miss Annett Sackett, Westfield.
Connecticut Valley, No. 19,	Rev. Elisha G. Hooper, Leyden.	Mrs. F. D. Jones, Turner's Falls.	Mrs. Henry B. Barton, Turner's Falls.

Hillside, No. 20,	Edwin Gloyd, Plainfield.	E. J. Clark, Worthington.	Mrs. G. L. Miner, East Windsor.
Swift River Valley, No. 21,	Edgar D. Winslow, Ware.	Mrs. Ella M. Winslow, Ware.	Miss Jennie P. Dodge, Enfield.
Mayflower, No. 22,	A. W. Gorham, North Hanson.	Mrs. Emily Baker, South Hanson.	Winthrop Fillebrown, Bryantville, R. F. D.
Middlesex Central, No. 23,	Charles H. Howard, 1839 Washington St., Auburndale.	George F. Reed, Lexington.	Frederick W. Taylor, 168 Commonwealth Ave., Concord Junction.
Cape Cod, No. 24,	Frank E. Howes, Dennis.	John F. Carlton, East Sandwich.	Henry C. Davis, Cummaquid.
Berkshire South, No. 25,	L. R. Miller, Great Barrington.	Mrs. G. W. Searing, Stockbridge.	Abram Dunlop, Great Barrington, R. F. D. 3.
Chebacco, No. 26,	Harry E. Murdock, Danvers.	Mrs. Chas. H. Preston, Hathorne.	Mrs. Fred A. Smith, Danvers.
Norfolk, No. 27,	Woodworth J. Rice, Millis.	Mrs. Hattie B. Day, Norfolk.	Mrs. Carrie C. Snyder, Walpole.
Middlesex-Essex, No. 28,	Edwin C. Miller, Wakefield.	Angier L. Goodwin, Melrose Highlands.	Miss Mary C. Breslin, Woburn.
Subordinate Granges.			
"Guiding Star" of Greenfield, No. 1,	J. W. Stetson, Greenfield.	Mrs. Mabel R. Holden, Greenfield.	Mrs. Agnes M. Handforth, Greenfield.
Deerfield, No. 2,	Whitman B. Wells, Deerfield,	S. P. Billings, Deerfield.	P. G. Davis, Deerfield.
Northfield, No. 3,	L. R. Alexander, Northfield.	T. R. Callender, Northfield.	Mrs. T. R. Callender, Northfield.
Groton, No. 7,	Frank B. Patterson, Groton.	William A. Woods, Groton.	Lois M. Wright, Groton.
Barre, No. 9,	Chas. P. Smith, Barre.	Mrs. Carrie Mathewson, Barre.	Miss Eva Williams, Barre.
Pittsfield, No. 14,	John Buckler, Pittsfield.	Mrs. Earl B. Foote, 47 Marcella Ave., Pittsfield.	Ralph H. Elmer, Box 1265, Pittsfield.
"Hope" of Hadley, No. 15,	Harold D. Barston, South Hadley, R. F. D.	Edward J. Burke, Hadley.	Mrs. R. Lyman Cook, Hadley.
Amherst, No. 16,	D. R. Whipple, Amherst.	Mrs. Lelah Strong, Amherst.	Mrs. F. A. Hibbard, North Hadley.
Cheshire, No. 17,	H. A. Martin, Cheshire.	Mrs. O. C. Martin, Cheshire.	Mrs. F. W. Cox, Cheshire.
Hinsdale, No. 19,	Harry E. Gardner, Hinsdale.	Alfred N. Warren, Hinsdale.	Mrs. L. L. Sherman, Hinsdale.
Westfield, No. 20,	Benjamin H. Ellis, Westfield.	Miss Eva F. Dorman, Westfield.	Miss Annett Sackett, Westfield.
Lanesborough, No. 21,	W. E. Foster, Lanesborough.	Mrs. Harriet Rice, Lanesborough.	Miss Ethel R. Wood, Lanesborough.
Worcester, No. 22,	Frederick Midgley, 357 Massasoit Rd., Worcester.	Mrs. Flora M. Dean, 7 Vincent Ave., Worcester.	Mrs. Nancy E. Moore, 92 Summer St., Worcester.
Dalton, No. 23,	Wesley B. Barton, Dalton.	Samuel I. Parker, Dalton.	Mrs. Lephia O. Warren, Dalton.

MASSACHUSETTS PATRONS OF HUSBANDRY — *Continued.*

NAME.	MASTER.	LECTURER.	SECRETARY.
Blandford, No. 24,	M. H. Cooley, Chester.	Charles E. Whitney, Chester.	Miss Nellie M. Ripley, Chester.
Easthampton, No. 27,	W. H. Clossom, Park St., Easthampton.	Mrs. W. B. Drury, 167 Union St., Easthampton.	Mrs. James A. Sturges, Northampton St., Easthampton.
Richmond, No. 32,	Arthur L. Reynolds, Richmond.	Mrs. Robert P. Coleman, Pittsfield, R. F. D. 1.	Miss Ida H. Barnes, Richmond.
Adams, No. 34,	D. E. Upton, Adams.	Mrs. C. A. Daniels, 18 Orchard St., Adams.	Agnes Johnson, Adams.
Lenox, No. 35,	Frank A. Dunbar, West Stockbridge, R. F. D.	Gladys I. Terrill, Lenox.	Horatio H. Sears, New Lenox.
Russell, No. 36,	Harry T. Dewey, Russell.	Miss Minnie Boyden, Russell.	Mrs. Gertrude Rogers, Russell.
"Thrifty" of Leverett, No. 37,	W. L. Woodard, Leverett.	Miss Ethel H. Beaman, Leverett.	Mrs. Fred Morrison, Leverett.
Granville, No. 40,	Mrs. Harry S. Hartley, Granville.	Mrs. Lucy M. Dickinson, Granville.	Mrs. Lena P. Church, Granville.
Montgomery, No. 45,	Myron E. Kelso, Montgomery.	Mrs. D. H. Hall, Montgomery.	Miss A. Williams, Montgomery.
Southwick, No. 46,	B. M. Hastings, Southwick.	Mrs. F. D. Lambson, Southwick.	C. A. Griffin, Southwick.
Becket, No. 47,	Horace J. Fairfield, Becket.	Mrs. A. L. Hays, Becket.	Mrs. H. J. Fairfield, Becket.
"Highland" of Huntington, No. 48,	W. T. Moore, Huntington.	Mrs. S. C. Wilbur, Huntington.	Mrs. R. A. Jenkins, Huntington.
"Granite" of South Worthington, No. 49.	R. H. Adams, Ringville.	Mrs. Isabel Cole, Huntington.	Mrs. Lora P. Adams, Ringville.
"Golden Rule" of Prescott, No. 52,	Frank R. Allen, Greenwich Village, R. F. D.	Mrs. F. G. Thayer, Greenwich Village, R. F. D.	Mrs. L. E. Gross, North Prescott.
Sterling, No. 53,	Charles F. Adams, Pratt's Junction.	L. A. Stuart, Pratt's Junction.	Miss F. Bertha Warren, Sterling.
Springfield, No. 54,	Henry A. Booth, 310 Main St., Springfield.	Mrs. Lula Merrill, Longmeadow.	Mrs. Nellie Mason, 37 Silver St., Springfield.
Cummington, No. 56,	C. Ashley Stevens, Cummington.	Miss B. L. Howes, Swift River.	Miss L. M. Ford, Cummington.
Auburn, No. 60,	Everett W. Stone, Auburn.	Miss Bertha I. Bird, Auburn.	Mrs. G. P. Whittemore, Auburn.
Egremont, No. 63,	A. Abram Dunlop, Great Barrington, R. F. D. 3.	Ray W. Spurr, Great Barrington, R. F. D. 3.	Mrs. Andrew Dunlop, Great Barrington, R. F. D. 3.

"Union" of Belchertown, No. 64,	Myron G. Ward, Belchertown.	Mrs. Dela Squires, Belchertown.	Mrs. Lillian Kelley, Belchertown.
Brimfield, No. 65,	Robert C. Sherman, Brimfield.	F. N. Lawrence, Brimfield.	Mrs. Mary K. Hitchcock, Brimfield.
Charlemont, No. 66,	Rev. H. A. Miles, Charlemont.	Mr. Herbert T. Walker, Charlemont.	D. J. Davenport, Charlemont.
Hardwick, No. 67,	Charles L. Stone, Gilbertville.	Miss Mabel L. Hernan, Hardwick.	Miss A. Maria Hillman, Hardwick.
Shelburne, No. 68,	D. T. Barnard, Bardwell's Ferry.	Mrs. William O. Long, Bardwell's Ferry.	Mr. Fred B. Dole, Bardwell's Ferry.
Ashfield, No. 69,	Clinton Wing, Ashfield.	Mrs. C. A. Smith, Ashfield.	Mrs. William H. Howes, Ashfield.
Phillipston, No. 70,	A. D. Clifford, Athol, R. F. D. 3.	D. W. Baker, Athol, R. F. D 3.	Mrs. Elvira Elliott, Athol, R. F. D. 3.
Leyden, No. 71,	Charles F. Severence, Greenfield, care of Leyden stage.	Miss Bessie M. Getchell, Greenfield, care of Leyden stage.	Mrs. Lucy M. Howes, Leyden.
"Prescott" of Pepperell, No. 73,	Forest O. Aodrews, East Pepperell.	Sarah B. Tucker, Pepperell.	Miss Florence M. Flynn, East Pepperell.
Princeton, No. 74,	Edward W. Brunsen, Princeton.	Miss Ethel Mirick, Princeton.	J. Harry Allen, Princeton.
Colrain, No. 76,	Frank A. Walden, Colrain.	Earle H. Temple, Shattuckville.	William M. Stacy, Shattuckville.
Windsor, No. 77,	Thomas J. Day, East Windsor.	Mrs. Thomas J. Day, East Windsor.	Mrs. G. L. Miner, East Windsor.
Holden, No. 78,	Reuben N. Moore, Holden, R. F. D.	Mrs. N. S. Sanborn, Holden, R. F. D.	Mrs. W. A. Stevens, Holden, Box 96.
Spencer, No. 79,	Thomas K. Faxon, Spencer.	Arthur Monroe, Spencer.	Miss Bertha M. Smith, Spencer.
Bernardston, No. 81,	Clarence S. Hale, Bernardston.	Mrs. Edwin B. Hale, Bernardston.	Miss Mary E. Slate, Bernardston.
"Manhan" of Southampton, No. 82,	Harry Crandall, Southampton.	Miss Ida Olds, Southampton.	Miss Julia E. Norris, Southampton.
Chesterfield, No. 83,	Walter B. Smith, West Chesterfield.	Mrs. Frank Baker, Bisbees.	M. T. Anderson, Chesterfield.
Warwick, No. 85,	George A. Witherell, Orange.	Mrs. Etta M. T. Bass, Warwick.	Sumner H. Baker, Orange, care of Warwick stage.
North Orange, No. 86,	H. Floyd French, Tully.	Mrs. Grace C. French, Tully.	G. A. Miller, North Orange.
Buckland, No. 87,	Herbert L. Keach, Buckland.	Mrs. Fleta Griswold, Buckland.	Miss Sarah Ward, Charlemont.
Lee, No. 88,	Duane S. Slater, Tyringham.	Mrs. W. A. Dikeman, Lee.	Hugh Johnston, Lee.
Worthington, No. 90,	Chas. F. Bates, Worthington.	Mrs. Clarence K. Bates, Cummington, R. F. D.	Arthur G. Capen, Worthington.
Charlton, No. 92,	John G. Hammond, Dodge, R. F. D.	W. Ernest Rich, Charlton.	Mrs. Rosa E. Bowers, Charlton Depot.
Grafton, No. 93,	Raymond Johnson, North Grafton.	Walter Cross, North Grafton.	Albert Jones, North Grafton.
Petersham, No. 95,	Benjamin W. Towne, Petersham.	Mrs. Alice S. Phillips, Petersham.	Mrs. Ruby J. Stone, Petersham.
Savoy, No. 99,	Margaret McCullock, Savoy.	– –	Mrs. C. A. Maranville, Savoy.
Shrewsbury, No. 101,	Charles M. Field, Shrewsbury.	Edward A. Logan, Shrewsbury.	Mrs. M. E. Chamberlin, Shrewsbury.
Stow, No. 103,	Harold C. Everett, West Acton, R. F. D.	Mrs. Mary Hendy, Maynard, R. F. D.	Miss Helen Adams, Maynard, R. F. D.

MASSACHUSETTS PATRONS OF HUSBANDRY — *Continued.*

NAME.	MASTER.	LECTURER.	SECRETARY.
"Garfield" of North Dana, No. 104,	Miner E. Powers, Greenwich Village, R. F. D.	Mrs. Carrie E. Powers, Greenwich Village, R. F. D.	Charles W. Loomis, North Dana.
Marlborough, No. 105, . . .	R. Harvy Taylor, 16 Pleasant Ct., Marlborough.	Mrs. Myrtle Fay, Franklin St., Marlborough.	Mrs. L. M. Howe, Fair View Farm, Marlborough.
West Boylston, No. 106, . .	Everett G. Record, West Boylston.	Mrs. Frank H. Baldwin, West Boylston.	Mrs. M. A. Cook, West Boylston.
Millbury, No. 107, . . .	G. Burton Stowe, West Millbury.	Mrs. R. J. Stockwell, West Millbury.	Lloyd H. Glover, West Millbury.
Hudson, No. 108, ...	Alfred F. Ordway, Hudson, R. F. D.	Mrs. Annie G. Floyd, Pope St., Hudson.	Mrs. Mary E. Lawrence, 55 Lincoln St., Hudson.
Sutton, No. 109, ...	Chester S. Jones, Sutton, R. F. D.	Mrs. John C. Dudley, Sutton, R. F. D.	Mrs. R. H. Richardson, Sutton, R. F. D.
Sherborn, No. 110, . . .	Henry C. Goulding, Sherborn.	Aaron C. Dowes, Sherborn.	Miss Julia N. Daniels, Sherborn.
Boylston, No. 111, . . .	Leroy F. Tucker, Mountain St., Worcester.	Charles H. Webber, Boylston.	Mrs. Lena Longley, Boylston.
"East Medway" of Millis, No. 112,	George C. Cook, Millis.	Lyman A. Cook, Millis.	Edward E. Adams, Millis.
Framingham, No. 113, . . .	Frank E. Tatreau, South Framingham, R. F. D.	Mrs. Lettie Taylor, Winter St., Framingham.	George E. Fay, 35 Winter St., Framingham.
Medfield, No. 114, . . .	Melvin R. Blood, Medfield.	Mrs. Clara A. Clark, Medfield.	A. H. Clark, Medfield.
Holliston, No. 115, . . .	F. Marcus Leland, Holliston.	Mrs. Lottie M. Champney, Holliston.	Nellie V. Pope, Holliston.
Westborough, No. 116, . . .	Willard J. Mayberry, Westborough, R. F. D. 2.	Mrs. Mary C. Graham, Westborough, R. F. D. 2.	Mrs. Julia H. Rogers, Westborough, R. F. D. 2.
Dover, No. 117, ...	Charles S. Bean, Needham, R. F. D.	Mrs. Inez M. Packard, Needham, R. F. D.	Miss Amy Gallagher, Dover.
Southborough, No. 118, . .	Walter B. Brewer, South Framingham, R. F. D.	William H. Onthank, Southborough, R. F. D.	Mrs. Fred Wells, Fayville.
Northborough, No. 119, . .	Harry F. Allen, Northborough.	Fannie B. Hildreth, Northborough.	Ethel M. Davis, Northborough.
Lancaster, No. 120, . . .	Horace E. Johnson, Lancaster.	Mrs. Myrtle McLenna, South Lancaster.	J. Fred Brown, South Lancaster.

Sudbury, No. 121,	Rev. George H. Clark, South Sudbury, R. F. D.	Mrs. Maude M. Miles, South Sudbury.	Mrs. Ida J. Rice, Maynard, R. F. D.
Templeton, No. 122,	Charles Maynard, Templeton.	Alice Fairbanks, East Templeton.	Mary Rich, Templeton.
Oxford, No. 123,	Miss Mabel R. Taft, Oxford.	Miss Mildred J. Brown, Oxford.	Miss Florence P. Turner, Oxford.
Ashland, No. 124,	Hiram A. Hotchkiss, Ashland.	Mrs. Ellen G. Stone, Olive St., Ashland.	Mrs. Lizzie F. Bennett, Front St., Ashland.
Upton, No. 125,	Miss Myrtice S. King, Upton.	Miss Minna J. Sanborn, Upton.	Mrs. L. Jennie Chapman, West Upton.
Hubbardston, No. 126,	John Cunningham, Hubbardston.	Nelson B. Smith, Hubbardston.	Miss Grace R. Prentiss, Hubbardston.
Amesbury, No. 127,	Ora C. Beede, Merrimac.	Miss Carrie M. Allen, 17 Greenwood St., Amesbury.	Charles F. Tibbetts, 220 Main St., Amesbury.
North Andover, No. 128,	George A. Rea, North Andover.	Franklin C. Roberts, North Andover.	Walter H. Hayes, North Andover.
Lincoln, No. 129,	Harold S. Cousins, South Lincoln.	Mrs. Charles E. Clark, Lincoln.	Francis B. Sargent, Concord, R. F. D.
Gardner, No. 130,	Charles J. Crabtree, Whitney St., Gardner.	Mrs. Nellie D. Nutting, Nutting St., Gardner.	Mrs. Mabel C. Bolster, 66 Greenwood St., Gardner.
Boxborough, No. 131,	Charles Richardson, West Acton, R. F. D. 1.	Mrs. Mary Burroughs, West Acton.	Mrs. Ada M. Durkee, West Acton, R. F. D. 1.
North Brookfield, No. 132,	Mrs. J. Georgia Stoddard, North Brookfield, R. F. D.	Mrs. Lila L. Lidstone, North Brookfield.	Mrs. Clara A. Lincoln, North Brookfield.
Berlin, No. 134,	Lemuel D. Carter, West Berlin.	Mrs. F. H. Turnbull, West Berlin.	Mrs. Bertha M. Cole, Berlin.
Norfolk, No. 135,	G. Fred Campbell, Norfolk.	Mrs. Hattie B. Day, Norfolk.	Mrs. Carrie Campbell, Norfolk.
Ipswich, No. 136,	Thomas R. Lord, Linebrook Rd., Ipswich.	G. H. Sprague, Turner Hill Farm, Ipswich.	Mrs. Helen M. Moulton, Essex Rd., Ipswich.
East Blackstone, No. 137,	Philip E. Thomas, Woonsocket, Rhode Island.	Mrs. S. Leona Thomas, 128 Willow St., Woonsocket, Rhode Island.	Mrs. Lora Estes, Blackstone, R. F. D.
Northampton, No. 138,	William Phillips, Hadley.	Miss Stella Aichmoody, 125 King St., Northampton.	Mrs. Bessie Gloyd, 149 State St., Northampton.
East Sandwich, No. 139,	Allen H. Jones, South Sandwich.	A. W. Higgins, Sandwich.	Mrs. Dorothy N. Holway, East Sandwich.
West Boxford, No. 140,	Harry L. Cole, Georgetown, R. F. D. 2.	Mrs. Hattie F. Chadwick, West Boxford.	Miss Matilda B. Lund, Ward Hill, R. F. D.
Montague, No. 141,	Carl Wright, Montague.	Mrs. Edith Newton, Montague.	Mrs. Kate Hayden, Montague.

MASSACHUSETTS PATRONS OF HUSBANDRY — *Continued.*

NAME.	MASTER.	LECTURER.	SECRETARY.
Bolton, No. 142,	Francis G. Mentzer, Bolton.	Gilbert H. Wheeler, Bolton.	Mrs. Grover C. Quimby, Bolton.
Mendon, No. 143,	Freeman C. Lowell, Mendon.	Mrs. William Irons, Mendon.	Miss Lois Congdon, Mendon.
Franklin, No. 144,	John S. Mackintosh, Franklin.	Charles E. Adams, Franklin.	Mrs. Susie E. Adams, Franklin.
Douglas, No. 145,	E. D. Leonard, West Sutton.	Mrs. Effie Jones, East Douglas.	Miss Alma Quintal, East Douglas.
West Newbury, No. 146,	Edward B. Germain, Rocks Village.	Mrs. Ruth A. Ruddock, Groveland.	Mrs. Harriet M. Ware, West Newbury.
West Springfield, No. 147,	Clarence Granger, Feeding Hills.	Mrs. Elizabeth Hotchkiss, Agawam.	Lillian M. Capron, 27 Hanover St., West Springfield.
Swansea, No. 148,	Francis L. Gardner, South Swansea.	Miss Hattie M. Brown, Swansea, R. F. D. 2.	Miss Bertha D. Tucker, Swansea, R. F. D. 2.
Harvard, No. 149,	S. Henry Waters, Harvard.	Etta M. Ripley, Harvard.	Mildred E. Tooker, Littleton.
Concord, No. 150,	Frederick Taylor, Concord Junction.	Allan Brown, Concord.	Miss Clara Pettigrew, Concord Junction.
East Longmeadow, No. 152,	George S. Wood, East Longmeadow.	Mrs. Hermon W. King, East Longmeadow.	Miss Pearl E. Wood, East Longmeadow.
Wilbraham, No. 153,	F. A. Bodurtha, Wilbraham, R. F. D. 2.	Mrs. O. L. Millard, North Wilbraham.	Mrs. Bertha W. W. Rice, Wilbraham.
Haverhill, No. 154,	Milton A. Corliss, 1003 Broadway, Haverhill.	Everett E. Dickey, 7 Smith St., Haverhill.	Mrs. Grace A. Merrill, 1231 Broadway, Haverhill.
Methuen, No. 155,	Edward D. Taylor, Howe St., Methuen.	Miss Sarah J. Harding, Methuen, R. F. D. 186.	Miss Blanche A. Blodgett, 4 Barker St., Methuen.
West Bridgewater, No. 156,	Mrs. Anna S. LeLacheur, West Bridgewater.	Harry LeLachuer, West Bridgewater.	Mrs. Rhoda Wilbur, West Bridgewater.
Granby, No. 157,	Earl M. Ingham, Granby.	Perley E. Davis, Granby.	Miss Gladys M. Rust, Granby.
"Newmasket" of Middleborough, No. 158.	Andrew Grant, North Middleborough.	Mrs. Lizzie Morse, North Middleborough.	Mrs. Annie D. Deane, North Middleborough.
"Green River" of Williamstown, No. 159.	Richard Stevens, Williamstown.	Miss Elva Bailey, Bracewell Ave., North Adams.	Mrs. Jennie Valancourt, Williamstown.

South Hadley, No. 160,	Herbert B. Lang, South Hadley.	Miss Verna Forbes, South Hadley.	Mrs. E. H. Lyman, West Newbury, R. F. D.
"Laurel" of West Newbury, No. 161,	Harold Evans, West Newbury, R. F. D.	Arthur F. Cunningham, Newburyport.	Mrs. Belle E. Kennett, West Newbury, R. F. D.
Dartmouth, No. 162,	L. Arthur Crapo, South Westport.	Mrs. Vesta Crapo, South Westport.	Mrs. H. A. Briggs, Dartmouth.
Dudley, No. 163,	George Penniman, Dudley.	Mr. Lester Alden, Dudley.	Miss Ethel Bates, Dudley.
Ware, No. 164,	F. D. Buffington, Ware.	Mrs. A. G. Buffington, Ware.	Miss M. R. Howard, Ware.
Hampden, No. 165,	Charles I. Burleigh, Hampden.	Miss Kenia Carew, Hampden.	Mrs. Mary A. Sessions, Hampden.
Wellesley, No. 166,	Cyrus F. Jenness, 116 Moffatt Rd., Waban.	Miss Lucile J. Favour, 99 Union St., Natick.	Charles F. Smith, Dover Rd., Wellesley.
Rowe, No. 167,	Mrs. A. L. Henry, Rowe.	Mrs. M. L. Proctor, Rowe.	Mrs. G. G. Stanford, Rowe.
Somerset, No. 168,	Mrs. Ida Stetson, Pottersville.	Mrs. Mary Rice, Pottersville.	Mrs. Lois A. Davis, Somerset, R. F. D.
Lunenburg, No. 169,	William A. Warren, Lunenburg.	Lewis L. Harrington, Lunenburg.	Arthur W. Rockwood, Lunenburg.
New Braintree, No. 170,	Harry D. Pollard, North Brookfield.	Miss Cora W. Titus, New Braintree.	Miss Clara K. Kittredge, North Brookfield.
Merrimac, No. 171,	B. Frank Sargent, Pond Hills, Amesbury.	Mrs. Carrie M. Gilman, Main St., Merrimac.	Mrs. Cora L. Wadleigh, Church St., Merrimac.
Ashby, No. 172,	Edwin Walker, Ashby.	Henrietta Willard, Fitchburg.	Flora E. Ingerson, Ashby, R. F. D. 1.
Hopkinton, No. 173,	Harold Austin, Woodville.	Mrs. Helen M. Phipps, Hopkinton.	Miss Minnie R. Kilburn, Hopkinton.
Brookfield, No. 174,	Elbert L. Bemis, Brookfield.	Mrs. Augusta Huntington, Brookfield.	Mrs. Jennie H. Bemis, Brookfield.
Athol, No. 175,	Fred R. Spaulding, Sanders St., Athol.	Mrs. Clara E. Shepard, 297 Main St., Athol.	Mrs. Fred R. Spaulding, Sanders St., Athol.
"Miller's River" of Orange, No. 176,	Joseph Cullen, Orange.	Miss Lulu Bronsdon, Orange.	Henry J. Coleman, Orange.
Sturbridge, No. 177,	Frank T. Haynes, Sturbridge.	Mrs. Mabel A. Nichols, East Brookfield, R. F. D.	Mrs. E. G. Barnes, Sturbridge.
Ludlow, No. 179,	Charles E. Chapman, Ludlow.	Isabel L. Chapman, Ludlow.	Alice Hatch, Ludlow.
West Brookfield, No. 180,	Arthur J. Sampson, West Brookfield.	Mrs. Grace Canterbury, West Brookfield.	Mrs. Nellie M. Thatcher, West Brookfield.
Westport, No. 181,	C. A. Brightman, Westport, R. F. D.	Miss A. S. Brightman, Westport, R. F. D.	Arthur T. Potter, Westport, R. F. D.
Southbridge, No. 182,	George E. Morse, Southbridge.	Mrs. Nellie F. Capen, Hamilton St., Southbridge.	Harry B. McKinstry, Sturbridge.

MASSACHUSETTS PATRONS OF HUSBANDRY — *Continued.*

NAME.	MASTER.	LECTURER.	SECRETARY.
Andover, No. 183, . . .	Fred A. Swanton, Andover.	Ira B. Hill, Lupin's Rd., Andover.	Edward W. Burtt, Andover.
Topsfield, No. 184, . . .	Henry F. Long, Topsfield.	Mrs. A. I. Fogg, Topsfield, R. F. D.	Miss A. G. Bradstreet, Topsfield.
Fitchburg, No. 186, . . .	Henry E. Rodiman, Fitchburg.	Henry W. Holman, Fitchburg.	Mrs. Nettie A. Woodman, 487 Water St., Fitchburg.
Littleton, No. 188, . . .	Charles A. Kimball, Littleton.	Mrs. Florence B. Wilcox, Littleton.	Miss Augusta W. Smith, Littleton Common.
Warren, No. 189, ...	Archer N. Tuttle, Warren.	Charles E. Wilson, Warren.	Miss J. L. Patrick, Warren.
Bellingham, No. 190, . . .	W. L. Bennett, Milford.	Mrs. Emily L. Bennett, Milford.	Miss Olive May Clark, Bellingham.
Winchendon, No. 192, . . .	Arnold B. Sawyer, Winchendon.	Mrs. E. J. McQuestion, Winchendon.	Charles W. Brooks, Winchendon.
Foxborough, No. 193, . . .	Walter S. Mann, Foxborough, R. F. D.	Merrill B. Small, Foxborough, R. F. D.	Miss Nellie F. Capen, Foxborough, Box 2.
Townsend, No. 194, . . .	Mrs. Emma F. Seaver, Townsend.	Mrs. Esther Scales, Townsend.	Mrs. Flora I. Atwood, Townsend.
Royalston, No. 195, . . .	Ernest L. Graves, Royalston.	Charles E. Richardson, Royalston.	Myron E. Stockwell, Royalston.
Easton, No. 196, ...	J. Elmer Adams, Eastondale.	Mrs. Hattie L. Hayes, North Easton, R. F. D.	Miss E. L. Howard, South Easton, R. F. D.
"Brookville" of Holbrook, No. 197,	J. Fred Gill, Avon.	Mrs. Ida F. Mulligan, 26 Center St., Brockton.	Mrs. Cora E. Shaw, 433 Howard St., Brockton.
Leominster, No. 198, . . .	Andrew S. Thompson, Fitchburg, R. F. D. 1.	Mrs. Grace Brock, 288 Highland Ave., Leominster.	Mrs. Bertha Burchstead, Main St., North Leominster.
Stoughton, No. 199, . . .	Ernest H. Gilbert, North Easton, R. F. D.	Miss Ella S. Henry, West Stoughton.	Mrs. J. M. Spaulding, West Stoughton.
Uxbridge, No. 200, . . .	J. Warren Ramsey, Uxbridge.	Miss Mabel Walker, Uxbridge.	Mrs. Louise Ramsey, Uxbridge.
Bridgewater, No. 201, . . .	Dr. George W. Cutler, Bridgewater, Lock Box 95.	Mrs. Mattie Willey, Bridgewater.	Miss Alice Rhoades, Bridgewater.
Ashburnham, No. 202, . . .	Ernest W. Lawrence, Ashburnham.	Mrs. S. Esther Lawrence, Ashburnham.	Mrs. Sadie M. Fosgate, Ashburnham.
Westminster, No. 203, . . .	Robert O. Hurd, Westminster, R. F. D. 2.	Mrs. G. C. Persons, Westminster, R. F. D. 2.	Mrs. L. E. Baker, Westminster, R. F. D. 1.

Rowley, No. 201,	Miss Edna E. Wallis, Rowley, R. F. D. 1.	Miss Minnie Blagden, Rowley, Box 112.	J. A. Marshall, Rowley.
"Webster" of Marshfield, No. 205,	Herbert A. Ryder, Marshfield.	Mrs. Walter I. Seaverns, Marshfield.	Walter I. Seaverns, Marshfield.
Tewksbury, No. 207,	Daniel P. Pike, Wamesit.	Mrs. G. A. Norris, Tewksbury.	Mrs. Olive M. Clark, 8 Western Ave., Lowell.
Westford, No. 208,	W. R. Taylor, Westford, R. F. D. 1.	Mrs. Mattie Sutherland, Westford.	Mrs. M. Aurilla Wright, Westford.
Hanson, No. 209,	A. H. Gadd, Bryantville, R. F. D.	Mrs. Maude R. Estes, South Hanson, R. F. D.	Mrs. Nan S. Harley, South Hanson.
Chicopee, No. 211,	E. L. Shaw, 150 Chicopee St., Chicopee.	Mrs. Arthur Megargle, 177 Chicopee St., Chicopee.	Mrs. Minnie A. Baldwin, 143 Chicopee St., Chicopee.
"Oak Hill" of Attleborough, No. 212,	S. M. Cash, Attleborough, R. F. D. 1.	Mrs. A. N. Cash, Attleborough, R. F. D. 1.	Mrs. M. P. Smith, Locust St., Attleborough.
"Massapoag" of Sharon, No. 213,	Elmer E. Farnham, Sharon.	Miss Laura R. Stothart, Sharon.	Mrs. Georgie B. Brown, Sharon.
Walpole, No. 214,	Samuel Sawyer, Walpole.	Mrs. Annie R. Stowell, Walpole.	Mrs. Carrie C. Snyder, Walpole.
Mattapoisett, No. 215,	H. T. Howard, Jr., Fairhaven.	Abby S. Westgate, Mattapoisett.	Dr. Walter E. Blaine, Mattapoisett.
Dracut, No. 216,	Asa Stickney, Lowell, R. F. D. 2.	Bert A. Cluff, Lowell, R. F. D. 2.	Mrs. F. M. Weinbeck, 192 Wentworth Ave., Lowell.
Norton, No. 218,	Alden G. Walker, Norton.	Allison J. Cowles, Norton.	Miss Nellie H. Lincoln, East Norton.
East Princeton, No. 219,	Van Aldrich, East Princeton.	Perley Aldrich, East Princeton.	Mrs. Nellie D. Tyler, East Princeton.
Sunderland, No. 220,	R. B. Brown, Sunderland.	Miss Adaline Clark, Sunderland.	Miss Ruth I. Clark, Sunderland.
"Anawan" of Rehoboth, No. 221,	H. A. Goff, Attleborough, R. F. D. 1.	H. O. Maxham, 101 Wilson Ave., Rumford, Rhode Island.	Mrs. Clara M. Thomas, Rehoboth.
Tyngsborough, No. 222,	Chester F. K. Bancroft, Nashua, N. H., R. F. D. 2.	Miss Jeannette Grant, Tyngsborough.	Norman R. Sherburne, Tyngsborough.
Billerica, No. 223,	Forest F. Collier, Billerica.	Mrs. Carrie C. Corkum, Billerica, R. F. D.	Miss Amy L. Corkum, Billerica, R. F. D.
Sheffield, No. 224,	George A. Scott, Sheffield.	Mrs. Augusta V. Palmer, Sheffield.	Albert M. Chapin, Sheffield.
Williamsburg, No. 225,	Leon B. Sanderson, Williamsburg.	Mrs. Silas Snow, Williamsburg.	Harry Warner, Haydenville.
West Medway, No. 226,	Mrs. Fortes D. Wheeler, Caryville.	Mrs. Rose M. Wood, West Medway.	Mrs. Katherine L. Siggins, Medway, R. F. D.
Heath, No. 227,	Oscar R. Thompson, Heath.	Mrs. Frank E. Stetson, Heath.	Mrs. James T. Carraher, Heath.
Salisbury, No. 228,	Miss Leota Stevens, Salisbury.	Miss Eva Bragg, Salisbury.	Miss Frances Bragg, Salisbury.
Cochituate, No. 229,	W. L. Bishop, Cochituate.	Sidney Loker, Cochituate.	Mrs. G. D. Bishop, Cochituate.

MASSACHUSETTS PATRONS OF HUSBANDRY — *Continued.*

NAME.	MASTER.	LECTURER.	SECRETARY.
Taunton, No. 230, . . .	N. E. Hall, Raynham.	Mrs. Sadie Rounds, 23 White St., Taunton.	D. Thurber Wood, Segreganset.
"Ponkapoag" of Canton, No. 231, .	Oscar D. Capen, Washington St., Canton.	Albert A. Boutelle, Canton, R. F. D.	Arthur E. Estey, Canton, R. F. D.
Plainfield, No. 232, . . .	Ralph E. Gloyd, Plainfield.	Mrs. Carrie Thatcher, Plainfield.	Mrs. Emma Gloyd, Plainfield.
Lexington, No. 233, . . .	Alonzo H. Glass, Trapelo Road, Waltham.	Mrs. Frank C. Cutter, Lexington.	Mrs. Miriam W. Glass, Trapelo Road, Waltham.
Newbury, No. 234, . . .	William C. Noyes, Newbury.	Miss Ethel L. Chase, Newburyport.	Joseph D. Rolfe, Newbury.
Oakham, No. 235, . . .	Mrs. Effie T. Swindell, Oakham.	Miss Lila Parkman, Oakham.	Miss Sara E. Butler, Oakham.
"Quascacunquen" of Byfield, No. 236.	Miss Harriet M. Pillsbury, Byfield.	Miss Mary N. Caldwell, South Byfield.	Miss Jessie N. Towne, Rowley, R. F. D.
Groveland, No. 237, . . .	Miss Mabelle M. Brown, 11 Broad St., Groveland.	Mrs. Grace Cherry, Thurlow St., Georgetown.	Miss M. Lottie Tuttle, 149 Main St., Groveland.
Bradford, No. 238, . . .	Justin Thornton, Ward Hill.	Barbara Stevens, Pecker St., Haverhill.	Grace F. Pierce, 4 New St., Bradford.
North Reading, No. 239, . .	Harvey G. Turner, North Reading.	Mrs. Helen F. Averill, North Reading.	Stanley W. Nichols, North Reading.
Palmer, No. 241, ...	C. W. Carpenter, Monson.	Mrs. Lillian Meserschmidt, Palmer.	Mrs. E. J. Freeman, Palmer.
Rutland, No. 242, . . .	Matthew J. Cullen, Rutland.	Mrs. K. Fitzpatrick, Rutland.	Mrs. Frances P. Hanff, Rutland.
Enfield, No. 243, ...	Miss Jennie P. Dodge, Enfield.	Mrs. Lillian Hand, Enfield.	Mrs. James Kelly, Smiths.
Chelmsford, No. 244, . . .	Walter E. Vickery, Chelmsford.	Frank J. Lupien, Chelmsford.	Harlan E. Knowlton, Chelmsford.
Greenwich, No. 245, . . .	Fred F. Newcomb, Ware, R. F. D. 2.	Mrs. Andrew J. Loux, Greenwich Village.	Miss Helen F. Hall, Ware, R. F. D. 2.
West Stockbridge and Alford, No. 246.	Charles L. Dikeman, West Stockbridge.	T. L. Curran, Housatonic, R. F. D. 1.	A. R. Hensel, State Line, R. F. D. 1.
"Harmony" of Easton, No. 247, .	Wilmarth P. Howard, South Easton.	Mrs. Clara Utton, South Easton.	Mrs. Jennie M. Goss, Easton.
Wendell, No. 248, . . .	Charles M. Ballon, Wendell.	Mrs. Mary Glidden, Wendell.	Lewis B. Bowen, Wendell Depot.
Baldwinsville, No. 249, . . .	Harold B. Stevens, Baldwinsville.	John H. Putnam, Baldwinsville.	Miss Ruby P. Lund, Baldwinsville.
Everett, No. 250, ...	Albert Kohr, 30 Walton St., Dorchester.	Mrs. H. M. McLellan, 114 Buckman St., Everett.	Miss K. M. Mack, 74 Baldwin Ave., Everett.

West Tisbury, No. 251,	James F. Adams, West Tisbury.	Mrs. Evelyn M. Adams, West Tisbury.	Frederick G. Vincent, West Tisbury.
"Wachusett" of Leominster, No. 252.	B. M. Vinton, 18 Haynes Court, Leominster.	Mrs. L. E. Harris, 100 Granite St., Leominster.	Miss Pearl Packard, 7 Arlington St., Leominster.
Halifax, No. 253,	William B. Wood, Whitman.	Clarence Devitt, Halifax.	Mrs. Elsie Anderson, Halifax.
Shirley, No. 254,	George H. Farmer, Shirley, R. F. D.	Mrs. Mabel E. Graves, Shirley Center.	Miss Margaret E. Evans, Shirley, R. F. D.
Chilmark, No. 255,	Fred A. Mayhew, Chilmark.	Mrs. E. B. Mayhew, Chilmark.	Mrs. Ruth H. Mayhew, Chilmark.
New Salem, No. 256,	Burton W. Cogswell, New Salem.	Mrs. E. O. Marshall, New Salem.	Mrs. G. S. Ballard, Millington, Box 53.
Rochester, No. 257,	Oscar Hulsman, Rock, R. F. D.	Mrs. Annie B. Cowen, Rock, R. F. D.	Mrs. Maud G. Barnes, Marion, R. F. D.
Carlisle, No. 258,	James S. Anthony, Carlisle.	Herbert Lee, Bedford, R. F. D.	Miss Alfreda Teabo, Carlisle.
Acton, No. 259,	William P. Kelley, West Acton, R. F. D.	Mrs. Albion L. Millan, Concord Junction, R. F. D.	Miss Ella L. Miller, North Acton.
Dennis, No. 260,	Frank E. Howes, Dennis.	Mrs. Josephine Greenleaf, Dennis.	Nathan Crowell, East Dennis.
East Charlemont, No. 261,	O. J. Hager, East Charlemont	Miss Edna Roberts, East Charlemont.	Mrs. O. J. Hager, East Charlemont.
Braintree, No. 262,	Chas. W. Matthews, 265 Liberty St., East Braintree.	Mrs. Harriet G. Tirrell, 265 Summer St., Weymouth.	Miss Mildred R. Dyer, 259 Pond St., South Braintree.
Danvers, No. 263,	N. Perley Clark, 234 Locust St., Danvers.	Elmer E. Allen, 370 Newbury St., Danvers.	Mrs. Mary P. Hooper, 67 Wenham St., Danvers.
"Quinobequin" of Medway, No. 264,	Dr. John H. Wyman, Medway.	Miss Phoebe Haskell, Medway.	Mrs. Cynthia C. Allbee, Medway.
Great Barrington, No. 265,	Leonard R. Miller, Great Barrington.	Charles R. Freehan, Great Barrington.	Charles T. Kellogg, Great Barrington.
"Hill Top" of Windsor, No. 267,	A. L. Turner, Windsor.	Not elected.	Mrs. Bertha Cady, Windsor.
Wilmington, No. 268,	Charles B. Osbon, Wilmington.	Dorothea Neilson, Wilmington.	Francene A. Morse, 44 Linden St., Reading.
"Mill River" of New Marlborough, No. 269.	Henry P. Comstock, New Marlborough.	Mrs. Mary Morrison, Hartsville.	Miss Sarah A. Joyner, New Marlborough.
South Weymouth, No. 270,	Roy C. Beale, South Weymouth.	John E. Inkley, South Weymouth.	Edward Hirt, South Weymouth.
Milford, No. 271,	John A. McKenzie, Milford.	William P. Greenwood, Milford.	Mrs. Minnie B. Wilcox, South Milford.
Brewster, No. 272,	Frank B. Crocker, North Brewster.	Mrs. Belle Culp, Brewster.	Mrs. Carrie S. Eldridge, Brewster.
Shutesbury, No. 273,	Chester N. Tupper, Shutesbury.	Mrs. Elizabeth Crossman, Shutesbury.	Mrs. M. A. Haskell, Shutesbury.
Westwood, No. 274,	W. H. MacLaren, Westwood.	Mrs. O. Crane, Westwood, R. F. D.	Miss C. L. Mylod, Westwood.
Westhampton, No. 275,	Gilbert I. Flint, Westhampton.	Mrs. Ellen L. Allyn, Westhampton, R. F. D. 2.	George E. Clapp, Westhampton, R. F. D. 2.

MASSACHUSETTS PATRONS OF HUSBANDRY — *Continued.*

NAME.	MASTER.	LECTURER.	SECRETARY.
"Ware Valley" of Ware, No. 276, .	Dr. James E. Kennedy, Ware.	Miss Katherine Glancy, 46 Eddy St., Ware.	W. Winslow Gibbs, Ware, R. F. D. 1.
Plympton, No. 277, ...	Harold W. Stiles, Plympton.	Mrs. Josephine A. True, Plympton.	Miss Nellie F. Sherman, Plympton.
Gill, No. 278, ...	L. C. Munn, Turner's Falls, R. F. D.	Mrs. A. M. Jones, Riverside.	Ernest C. Atherton, Gill.
Newburyport, No. 279, . . .	Percy B. Jackson, 40 Market St., Newburyport.	Miss Katherine Player, 51 Pleasant St., Newburyport.	Miss Katherine W. Gillett, 54 Purchase St., Newburyport.
"Pocasset" of Bourne, No. 280, .	H. P. Handy, Cataumet.	Mrs. Bessie Ryder, Pocasset.	C. H. Scott, Cataumet.
Vineyard Haven, No. 281, . .	Mrs. Lizzie Walker, Vineyard Haven.	Mrs. Carrie B. Hammett, Vineyard Haven.	Edward Ames, Vineyard Haven.
Waltham, No. 282, . . .	Charles H. Howard, 1839 Washington St., Auburndale.	Miss Cora B. Stone, 1295 Main St., Waltham.	Miss Jennie W. Graham, 61 Adams St., Waltham.
Bedford, No. 283, ...	George H. Sweetnam, Bedford.	Luther A. Ford, Bedford.	Miss Luella F. Sweetnam, Bedford.
East Bridgewater, No. 284, . .	William Burhoe, Whitman, R. F. D. 1.	H. C. Bacon, Whitman, R. F. D. 2.	Charles D. Meservey, Whitman, R. F. D. 1.
Acushnet, No. 285, . . .	F. M. Weeden, Acushnet Station, New Bedford.	S. H. Jackson, Acushnet Station, New Bedford.	J. Geggatt, Jr., Acushnet Station, New Bedford.
West Gloucester, No. 286, . .	John R. Kain, Gloucester, R. F. D. 1.	William P. Wakefield, Gloucester, R. F. D. 1.	Mrs. Carrie T. Currier, Gloucester, R. F. D. 1.
Woburn, No. 287, . . .	Robert Gibson, Cambridge St., Woburn.	Mrs. Bertha Menchin, Bedford St., Woburn.	Miss Margaret Hearn, 51 Harrison Ave., Woburn.
Duxbury, No. 288, . . .	Arthur C. Greene, Duxbury.	Dr. Byron C. Leavitt, Millbrook.	Miss L. T. Peterson, Millbrook.
Yarmouth, No. 289, . . .	Gorham Pulsifer, Yarmouth Port.	William H. Crocker, Barnstable.	Lawrence D. Hinckley, Barnstable.
Norwood, No. 290, . . .	Edward D. Baker, Norwood.	Miss Pearl Appleby, Norwood.	Mrs. Viola F. Chamberlain, Norwood.
Monterey, No. 291, . . .	Charles H. Minor, Monterey Stage, Great Barrington.	Miss Jennie Maleady, Monterey.	Jared B. Thompson, Monterey.

Saugus, No. 292,	Carl F. Koch, 594 Broadway, Saugus.	Miss Emma Newhall, 24 Foster St., Saugus.	Miss M. E. Moses, 99 Vine St., Saugus.
Wakefield, No. 293,	James W. Glover, 66 West Chestnut St., Wakefield.	Mrs. Ida F. Miller, 18 Lawrence St., Wakefield.	Miss Grace E. Ryan, 16 Walnut St., Wakefield.
Georgetown, No. 294,	Frank A. Jones, Georgetown.	Mrs. Clara E. Illsley, E. Broadway, Haverhill.	Mrs. Olivia K. Anderson, 78 North St., Georgetown.
Stockbridge, No. 295,	George A. Breed, Stockbridge.	Mrs. Minnie O. Thayer, West Stockbridge, R. F. D.	Mrs. L. M. Van Deusen, Stockbridge.
Miller's Falls, No. 296,	Luther W. Rixford, Miller's Falls.	Mrs. M. J. Kavanaugh, Miller's Falls.	Harry D. Towne, Miller's Falls.
Hamilton-Wenham, No. 297,	George W. Preston, Wenham St., Danvers.	Mrs. Alice B. Donaldson, South Hamilton.	Joseph F. Lynch, Wenham St., Danvers.
Boxford, No. 298,	Chester Killam, East Boxford.	Miss Amy G. Parkhurst, Boxford.	Miss Bertha Perley, Boxford.
Hingham, No. 299,	George H. Downing, Hingham Center.	Arthur Beale, Hingham, R. F. D.	Bertram L. Blanchard, Hingham Center.
Ayer, No. 300,	Willard G. White, Shirley.	Mrs. Jennie Leahy, Ayer.	Mrs. Margaret Rand, Ayer.
Whitman, No. 301,	Benjamin Y. Benson, 1122 N. Washington St., Whitman.	Miss Hattie M. Thompson, 23 Burton Ave., Whitman.	Mrs. Florence Allis, 712 Plymouth St., Whitman.
Pembroke, No. 302,	William C. Jones, East Pembroke.	Edgar C. Thayer, South Hanson.	Mrs. Celia M. Howe, Bryantville.
Weston, No. 303,	Herbert E. Tyler, Kendall Green.	J. Melvin Schwartz, Weston.	Joseph R. Roberts, Weston.
Whately, No. 304,	Fred B. Bardwell, Haydenville, R. F. D.	Mrs. Fred L. Graves, East Whately.	Mrs. A. H. Beers, Whately.
West Peabody, No. 305,	Harry R. Rankin, West Peabody.	Perley C. Goodale, West Peabody.	Miss Rena Decatur, 3 Tremont St., Peabody.
Beverly, No. 306,	Gilbert A. Kimmens, Brimbal Ave., Beverly.	Percy E. Haley, 64 Dodge St., Beverly.	Miss Evelyn F. Foster, East St., Beverly.
East Freetown, No. 307,	Mr. Wallace T. Chace, Clifford.	Miss Emily A. Delano, Clifford.	Miss Ida C. Chace, Clifford.
Eastham, No. 308,	Leslie E. Chase, Eastham.	Mrs. Christiana Sullivan, Eastham.	Mrs. Mabel W. Chase, Eastham.
Paxton, No. 309,	H. S. Robinson, Paxton.	Mrs. Mabel Durgin, Paxton.	Victor A. Blackmer, Paxton.
Middlefield, No. 310,	John T. Bryan, Chester, R. F. D. 2.	Henry S. Pease, Chester, R. F. D. 2.	Mrs. Gertrude L. Pease, Middlefield.
Raynham Center, No. 311,	John Rogers, Jr., Raynham Center.	George F. Thompson, Raynham Center.	Mrs. Stella Kenney, Raynham Center.
Rockland, No. 312,	Edward H. Williams, Rockland.	Mrs. Edith C. Abbott, 1097 Washington St., North Abington.	Alden C. Brett, North Abington.
Northbridge, No. 313,	F. P. Cummings, Whitinsville.	Mrs. M. Hammond, 108 Linwood Ave., Whitinsville.	Mrs. Eva M. Smyth, Whitinsville.

Massachusetts Patrons of Husbandry — *Concluded.*

NAME.	MASTER.	LECTURER.	SECRETARY.
"Dighton Rock" of Dighton, No. 314.	Joseph Howland, Berkley.	Mrs. Luella A. Green, Berkley.	Howard C. Briggs, Segreganset.
Mansfield, No. 315,	Walter P. Sheridan, Oakland Ave., Mansfield.	W. M. Hobbs, 28 Hodges St., Mansfield.	Mrs. Milton A. Parker, 10 Davis St., Mansfield.
Randolph, No. 316,	J. Harry Mason, Randolph.	Miss Isabel T. Whitcross, Randolph.	Raymond L. Mason, Randolph.
Assonet, No. 317,	Charles L. Strange, Assonet.	Mrs. Mary P. Herbert, Assonet.	Mrs. Ethel M. Grinnell, Assonet.
"Cotuit" of Barnstable, No. 318,	Ernest E. Smith, Cotuit.	Miss Florence Flewelling, Cotuit.	Mrs. C. Coleman, Marston's Mills.
Marblehead, No. 319,	Waldo C. Gage, 150 Elm St., Marblehead.	Mrs. Helena B. Tedford, Mt. Vernon St., Marblehead.	Mrs. Martha E. Peeker, Tedesco St., Marblehead.
South Royalston, No. 320,	Harold Mosher, South Royalston.	Mrs. J. F. Wilkey, South Royalston.	Miss Florence E. Wheeler, South Royalston.
Lynnfield, No. 321,	George N. Abbott, Wakefield, R. F. D. 1.	Mrs. Edna Smith, Lynnfield.	Mrs. Alice McMahon, Lynnfield.
Reading, No. 322,	Ernest T. Wakefield, Wakefield St., Reading.	Grace Damon, Belmont St., Reading.	Minnie K. Eames, 10 Howard St., Reading.
Kingston, No. 323,	George W. Bosworth, Kingston.	Everett G. Loring, Kingston.	Mrs. Carrie D. Holmes, Kingston.
Natick, No. 324,	Willoughby C. Lyford, 136 Walnut St., Natick.	Myrtle Markham, 57 North Main St., Natick.	Abbie H. Goulding, Natick.
Hancock, No. 325,	Charles L. Lapham, Hancock.	Mrs. Myrtle Higgens, Hancock.	Mrs. Fannie M. Hadselle, Hancock.
Stoneham, No. 326,	James W. Hibbs, Cedar Ave., Stoneham.	Mrs. Annie L. Knapp, 77 Williams St., Stoneham.	Resigned.
Middleton, No. 327,	George E. Barnaby, Middleton.	Miss Marion E. Tyler, Middleton.	Miss B. Gertrude Hayward, Middleton.
Plainville, No. 328,	Sylvester J. Smith, Plainville.	John J. Eiden, Plainville.	Walter P. Marble, West Wrentham, R. F. D.
Wrentham, No. 329,	Mrs. Graceton H. Dowes, Wrentham.	Mrs. S. Wallace, Wrentham.	Miss Helen F. Bennett, Wrentham.
"Riverdale" of Gloucester, No. 330,	Allen J. Tucker, Riverdale, Gloucester.	Mrs. Gardner Allen, Riverdale, Gloucester.	Annie L. Day, Riverdale, Gloucester.

Melrose, No. 331,	Philip B. Carter, 51 Batchelder St., Melrose.	Angier L. Goodwin, 33 Reading Hill Ave., Melrose.	Bertha M. Bowen, 46 Sargent St., Melrose.
Peabody, No. 332,	George E. Hayes, 29 Sutton St., Peabody.	Richard B. Mackintosh, 21 Aborn St., Peabody.	Mrs. Lily S. Ferguson, 87 Endicott St., Peabody.
Otis, No. 333,	John B. Soule, East Otis.	Mrs. Arthur Jones, North Otis.	Mrs. Edward S. Fenn, Otis.
"Rochdale" of Leicester, No. 334,	Harry W. Merriam, Rochdale.	Mrs. Hattie B. Rich, Rochdale.	Miss Mary F. Milner, Rochdale.
Lowell, No. 335,	Robert F. Marden, Lowell.	Mrs. Caroline W. Crawford, Lowell.	Hallie E. Whitney, 82 S. Walker St., Lowell.
Dedham, No. 336,	Samuel H. Capen, Dedham.	Walter H. Young, Dedham.	E. Worthington, Dedham.
South Middleborough, No. 337,	Lyman P. Thomas, Rock.	Mrs. Susan Murdock, South Middleborough.	Mrs. Estella Southworth, South Middleborough.
West Wareham, No. 338,	Chester A. Churchill, West Wareham.	Mrs. George Jefferson, West Wareham.	Miss Mabel C. Churchill, West Wareham.
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